331

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

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Zenith Z 2255 E R : Z 2257 E, M, R ! Z 3010 E, H, R, y (Ch. 19 Z 22, 19 Z 22 Q) 331-16-S

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SUPPLEMENTAL DATA TO PHOTOFACT FOLDER 5 IN SET 278

Magnavox Chassis CMUA435AA, CMUA436AA, CTA435AA, CTA436AA (250 Series) were covered in Photofact Folder 5 — Set 278.

CORRECTION NOTICE

A typegraphical error was made in listing the width coil (T5) part number. The correct part number is #360585-2.

Two new horizontal output transformer replacements have been introduced. Following is a complete chart showing the replacements for sweep circuit components.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA							
		MAGNAVOX PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	Horiz. Output Trans.	360606 360606-1①					A-8294	FLY-79	
T3	Vert. Output Trans.	320067-2	Z1806	A-3039	226T1	V312	A-8141	26S54	A-104X
T4A	Yoke-Horiz. (18.5MH)	360587-3	DF605 ②	MDF-73②	222D1 ②	Y70F18/43 ②	DY-11A ②	Y-9 ②	Y-22 ②
B	Vert. (41MH)								
T5A	Width-Parallel Coil (4.2-32MH)	360585-2		MWC-10				WC-24	
B	Width-Series Coil (.22-2.3MH)								

① Alternate horizontal output transformer.
② Use original yoke damping network.

Chassis CMUA435BB, CMUA436BB, CMUA437BB, CMUA438BB, CTA435BB, CTA436BB, CTA437BB, CTA438BB are electrically identical to the chassis covered except for the following changes.

COMPONENT CHANGES

C40 is increased from 680MMF to 800MMF.

R33 is increased from 8.2K to 15K.

C42 is increased from 430MMF to 470MMF.

C45 is increased from .02MFD to .1MFD.

R94 is increased from 82K to 100K.

R4, horizontal hold control, is increased from 25K to 50K, part #220129-7.

L41, discriminator, is changed to part #360613-1.

T3, vertical output transformer is changed to part #320254-3. Replacement data for this part is the same as given for part #320067-2 shown in the above chart.

M1, fuse, is increased from 150MA @ 125V to 250MA @ 250V.

Chassis
CMUA436BB
CMUA437BB
CMUA438BB
CTA436BB
CTA437BB
CTA438BB

AUDIO OUTPUT CIRCUIT

The audio output circuit has been revised. A partial schematic showing the revised circuit is given on the reverse side.

MAGNAVOX CHASSIS CMUA435AA, CMUA435BB, CMUA436AA, CMUA436BB, CMUA437BB, CMUA438BB, CTA435AA, CTA435BB, CTA436AA, CTA436BB, CTA437BB, CTA438BB (250 Series)

PRODUCTION CHANGES
BULLETIN 168

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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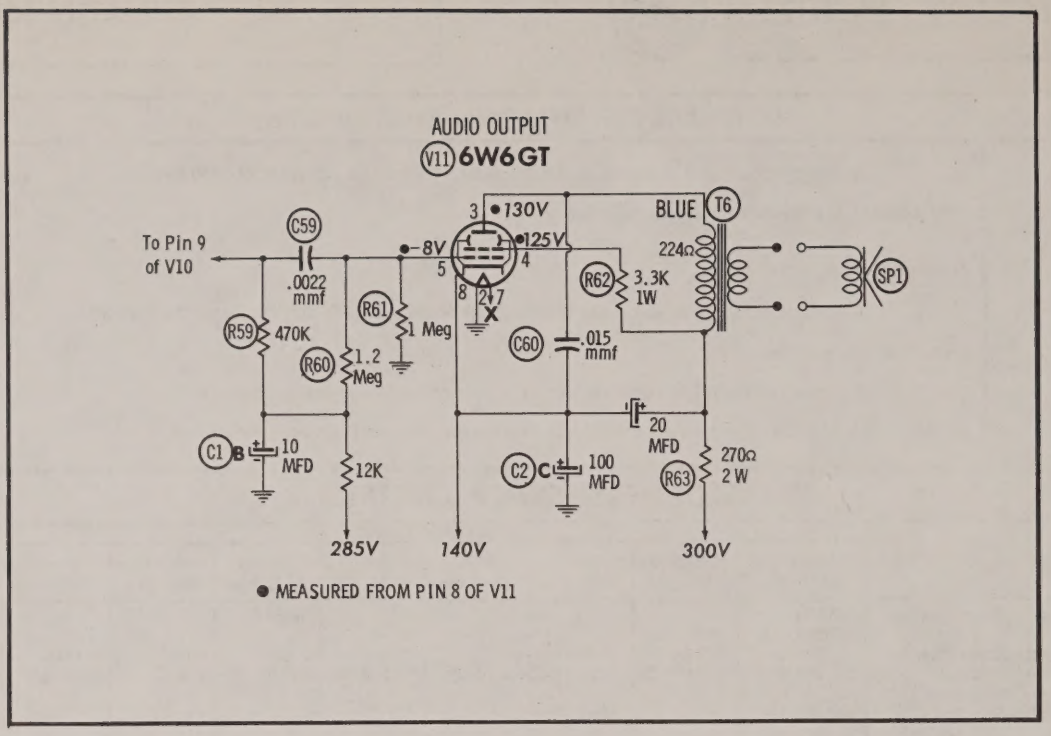

AUDIO OUTPUT
V11 6W6GT
To Pin 9 of V10
C59
.0022 mmf
R59 470K
R60 1.2 Meg
R61 1 Meg
-8V
3
•130V
1
•125V
4
5
8
2,7
X
BLUE
T6
224Ω
R62 3.3K 1W
SP1
C60 .015 mmf
20 MFD
C1 B
10 MFD
12K
C2 C
100 MFD
R63 270Ω 2 W
285V
140V
300V
• MEASURED FROM PIN 8 OF V11

SUPPLEMENTAL DATA TO PHOTOFACT FOLDER 11 IN SET 315

SENTINEL MODELS 1U-1101, 1U-1111, 1U-1121, 1U-1124, 1U-1126, 1U-1127, 1U-1131, 1U-1134, 1U-1136, 1U-1137, 1U-1145, 1U-1147, 1U-1155, 1U-1157, 1U-1161, 1U-1164, 1U-1165 1U-1171, 1U-1174, 1U-1175, 1U-2110, 1U-2112, 1U-2145, 1U-2161, 1U-2164, 1U-2165

Sentinel Models 1U-1101, 1U-1111, 1U-1121, 1U-1124, 1U-1126, 1U-1127, 1U-1131, 1U-1134, 1U-1136, 1U-1137, 1U-1145, 1U-1147, 1U-1155, 1U-1157, 1U-1161, 1U-1164, 1U-1165, 1U-1171, 1U-1174, 1U-1175, 1U-2110, 1U-2112, 1U-2145, 1U-2161, 1U-2164 and 1U-2165 were covered in Photofact Folder 11 — Set 315.

The following production changes were made in later production. These changes cover all models.

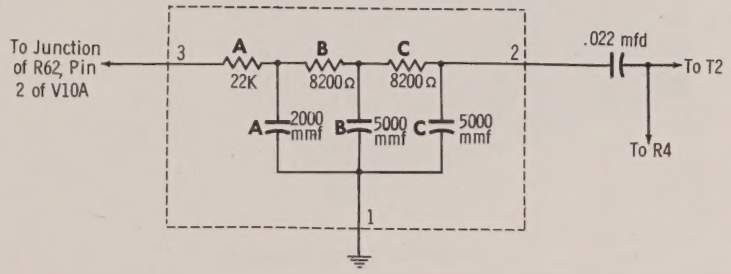
VERTICAL INTEGRATOR CHANGED

The vertical integrator couplate is changed to part #23E2023-9.

C65 is omitted.

A .022MFD Ⓐ 400V capacitor is added between terminal 2 of the vertical integrator couplate and the junction of R4 and T2.

With the above changes a partial schematic showing the new vertical integrator circuit is given below.



SUPPLEMENTAL DATA TO PHOTOFACT FOLDER 4 IN SET 313

GENERAL ELECTRIC MODELS 21C110, 21C111, 21C112, 21C113, 21C123, 21C124, 21C125, 21C126, 21C127, 21T038, 21T039, 21T041, 21T042, 21T043, 21T045, 21T048, 24C180, 24C181, 24T070, 24T071 ("S" Line)

General Electric Models 21C110, 21C111, 21C112, 21C113, 21C123, 21C124, 21T038, 21T039, 21T041, 21T042, 21T043, 24C180, 24C181, 24T070 and 24T071 ("S" Line) were covered in Photofact Folder 4 — Set 313.

Models 21C125, 21C126, 21C127, 21T045 and 21T048 ("S" Line) are added, along with late production changes, with the publication of this bulletin.

TUBE CHANGE

In some models V17, picture tube, is a 21BAP4 and does not require an ion trap.

SWEEP COMPONENT CHANGES

The part number for T3, horizontal output transformer is changed to RTO-183.

The part number for T4, vertical output transformer is changed to RTO-184.

The part number for T5, deflection yoke is changed to RLD-071.

The above sweep component changes can not be interchanged with the early production sweep components, unless all three units are changed at the same time.

TO IMPROVE AGC ACTION

C37 is removed from between L25 and ground and is reconnected from the high side of L25 and pin 1 of V4. The low side of L25 is grounded.

COMPONENT CHANGES

R80 may be a 12K, 15K or 22K resistor.

R99 may be a 12K, 15K or two 27K resistors wired in parallel.

R54 may be 180K or a 33K resistor.

(Con't on reverse side)

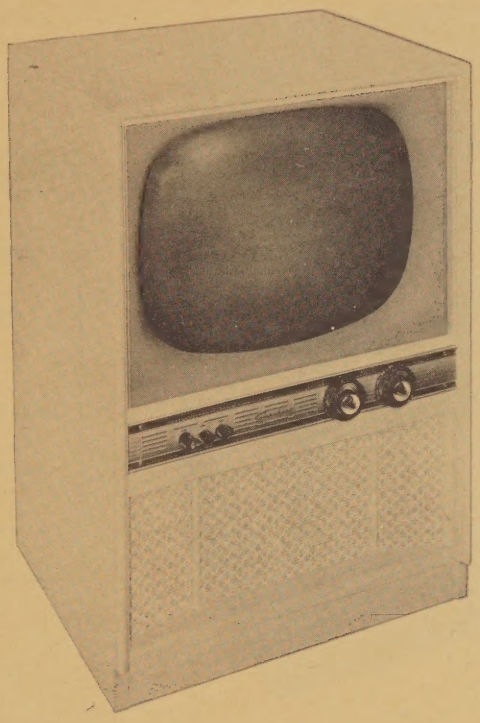
	TO CENTER THE RANGE OF THE VERTICAL HOLD CONTROL A 120K resistor is added between R4 and R81. When replacing V11, it may be necessary to remove the resistor added above.
	TO REDUCE PICTURE RINGING C47 is increased from 5000MMF to 10000MMF.

CAPEHART
CHASSIS CX-38S SERIES

IMPORTANT FILING NOTICE

The contents for this envelope will be found among the last folders in this complete set of folders . . . *unless* it has been purchased as part of a *complete* volume of PHOTOFACTS assembled in a DeLuxe Binder.

Merely insert the corresponding folder on this model in this envelope to retain proper filing and indexing order.



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DENVER, COLORADO

CAPEHART MODEL 11C216BD-5

TRADE NAME	Capehart	MODELS	CHASSIS
		3T216BD-4, 3T216BD-5, 3T216MD-4, 3T216MD-5, 6T216BD-4, 6T216BD-5, 6T216MD-4, 6T216MD-5, 11C216BD-4, 11C216BD-5, 11C216MD-5, 11C216MD-5, 16C216BD-4, 16C216BD-5, 16C216FD-4, 16C216FD-5, 16C216MD-4, 16C216MD-5	CX-38S
MANUFACTURER	Capehart-Farnsworth Co., Fort Wayne, Indiana		
TYPE SET	Television Receiver		
TUBES	Twenty-one		
POWER SUPPLY	110-120 Volts AC-60 Cycle	RATING 1.8 Amp. @ 117 Volts AC	
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)		

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CAPEHART
CHASSIS CX-38S SERIES

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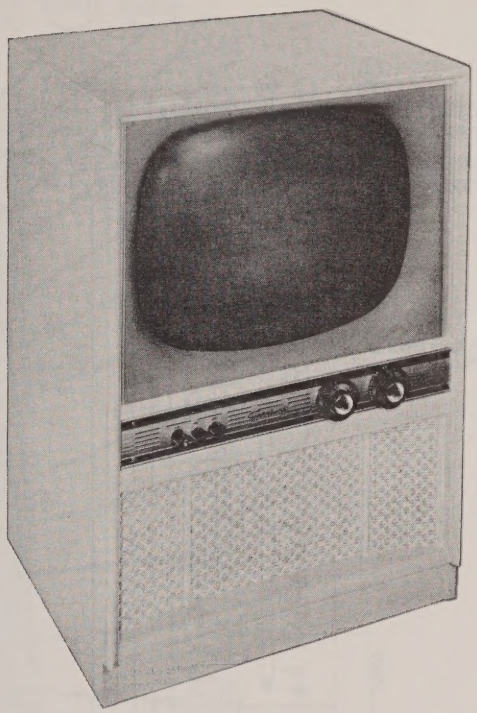

MODEL CHASSIS

11C216BD-5..... CX-38S

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 9 push-on type control knobs from front panel of cabinet.

2. Remove 7 wood screws and 1 metal screw. Remove rear cover.

3. Disconnect speaker plugs at speakers.

4. Loosen 2 wood screws holding antenna terminal bracket and remove.

5. Remove 2 wood screws from 2 top picture tube braces.

6. Remove 4 chassis bolts. Remove chassis.

7. Remove 8 speaker nuts. Remove 3 speakers.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

For touch-up adjustment of VHF tuner oscillator adjustments, it is necessary to remove the chassis from the cabinet. (See disassembly instructions).

PICTURE TUBE SAFETY GLASS CLEANING

Remove 4 wood screws holding wood molding at the top edge of the safety glass. Remove molding and safety glass. Use extreme caution when removing safety glass.

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

SPECIAL ADJUSTMENTS

Picture Lock Adjustment :

Adjustment of the picture lock control is located on the rear panel of the chassis.
Tune in a TV station, preferably strongest in the area. Rotate the picture lock control (R7) to its maximum clockwise position. While observing the picture slowly rotate R7 counter clockwise until the picture starts to shift to the left. Rotate R7 back clockwise to the position just prior to the point where the picture starts to shift to the left. In extreme noisy and weak signal areas, adjustment of R7 should be made along with other sync adjustments for stable horizontal and vertical sync.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Remove the rear cover and supply power the set. Set the horizontal hold control to the center of its range and adjust the horizontal oscillator ringing slug (L21) until the picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the noise rejection control (R6) located on the rear panel of the chassis for MINIMUM buzz.

FUSES

One fuse is used for LV power supply protection. (For location see tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

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CHASSIS CX-38S SERIES

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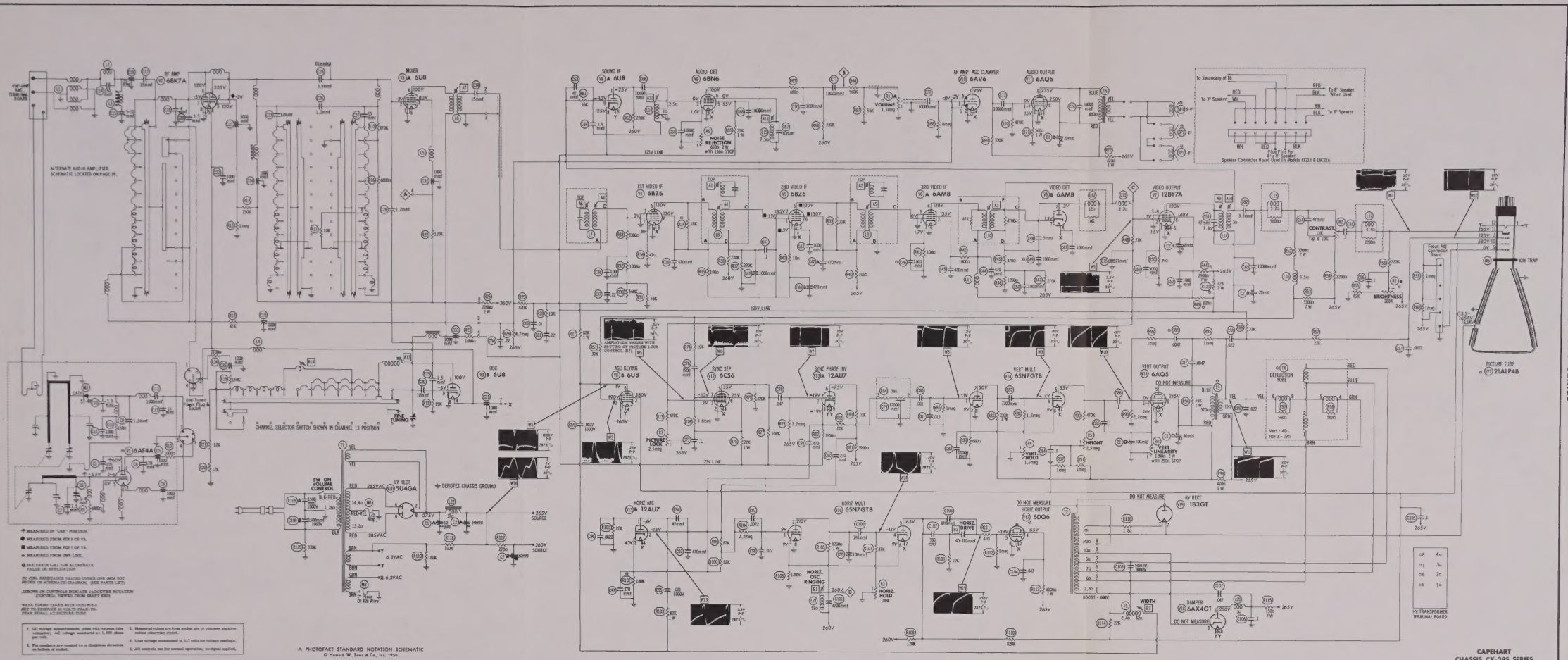
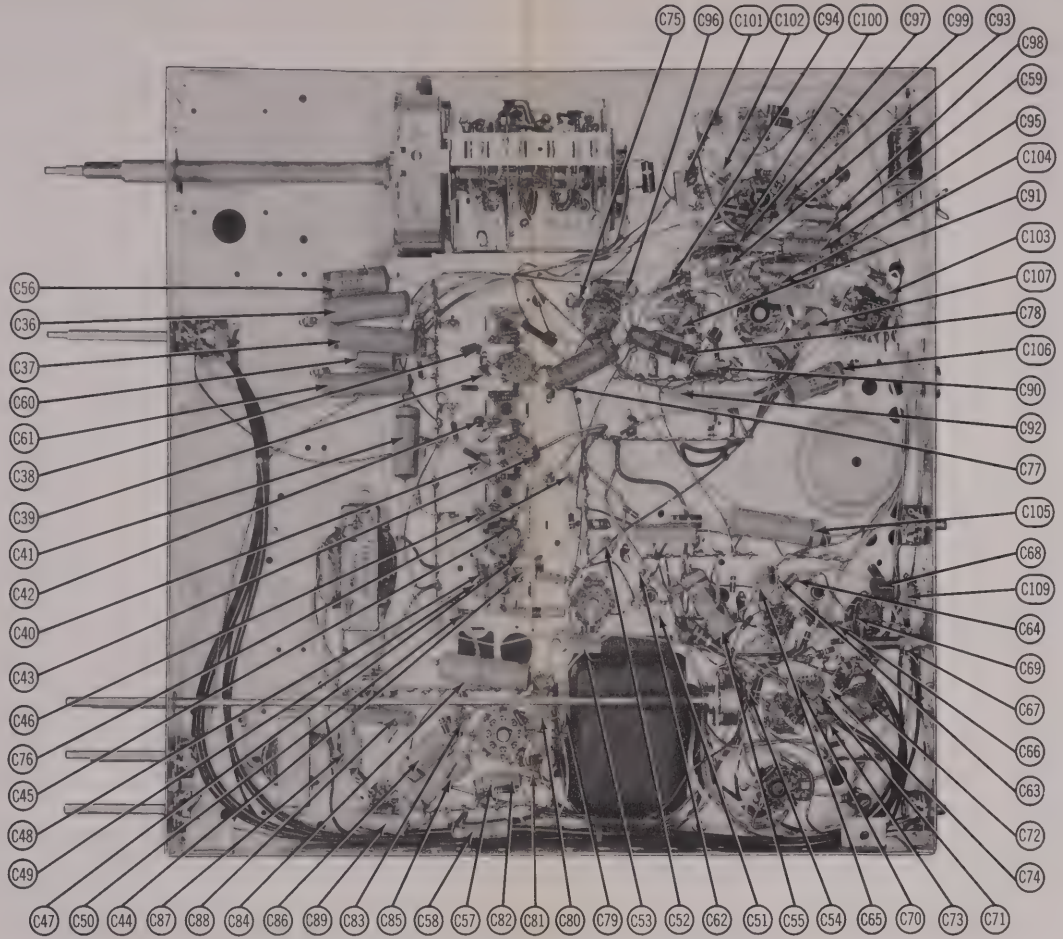
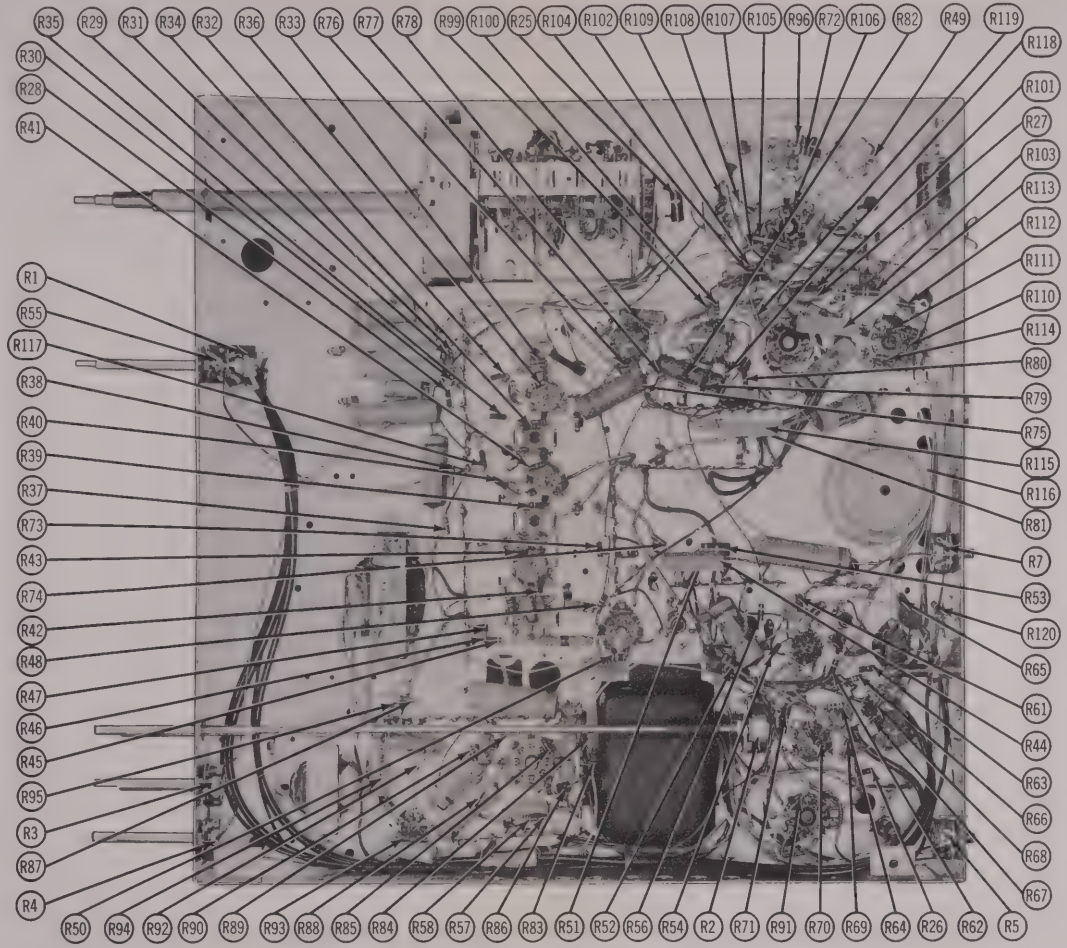

CAPEHART CHASSIS CX-385 SERIES
CAPEHART CHASSIS CX-385 SERIES
A PHOTOFACT STANDARD NOTATION SCHEMATIC
© Howard W. Sams & Co., Inc. 1956
ALTERNATE AUDIO AMPLIFIER SCHEMATIC LOCATED ON PAGE 19.
CHANNEL SELECTOR SWITCH SHOWN IN CHANNEL 13 POSITION
DENOTES CHASSIS GROUND
SW ON VOLUME CONTROL
LV RECT 5U4GA
HV RECT 1B3GT
PICTURE TUBE 21ALP4B
ION TRAP
HV TRANSFORMER TERMINAL BOARD
Speaker Connector Board Used On Models 6T216 & 16C216
Focus Adj Connector Board
DO NOT MEASURE
1ST VIDEO IF 6BZ6
2ND VIDEO IF 6BZ6
3RD VIDEO IF 6AM8
VIDEO DET 6AM8
VIDEO OUTPUT 12BY7A
SOUND IF 6U8
AUDIO DET 6BN6
AF AMP AGC CLAMPER 6AV6
AUDIO OUTPUT 6AQ5
RF AMP 6BK7A
MIXER 6U8
OSC 6U8
6AF4A
AGC KEYING 6U8
SYNC SEP 6CS6
SYNC PHASE INV 12AU7
VERT MULT 6SN7GTB
VERT OUTPUT 6AQ5
HORIZ AFC 12AU7
HORIZ MULT 6SN7GTB
HORIZ OUTPUT 6DQ6
DAMPER 6AX4GT
CONTRAST
BRIGHTNESS
HEIGHT
VERT HOLD
VERT LINEARITY
HORIZ HOLD
WIDTH
BOOST +600V
NOISE REJECTION
VOLUME
FINE TUNING
PICTURE LOCK
HORIZ OSC-RINGING
HORIZ DRIVE
DEFLECTION YOKE
265V SOURCE
260V SOURCE
12V LINE
6.3VAC
285VAC
275V
AMPLITUDE VARIES WITH SETTING OF PICTURE LOCK CONTROL (R77).
ALL MEASURED IN "CW" POSITION.
◆ MEASURED FROM PIN 5 OF V3.
■ MEASURED FROM PIN 1 OF V3.
▲ MEASURED FROM 280-330K.
● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION.
DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM. (SEE PARTS LIST)
ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION OF CONTROL VIEWED FROM SHAFT END.
WAVE FORMS TAKEN WITH CONTROLS SET TO PRODUCE 50 VOLTS PEAK-TO-PEAK SIGNAL AT PICTURE TUBE
1. DC voltage measurements taken with vacuum tube voltmeter. AC voltage measured at 1,000 ohms per volt.
2. Tie numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. All controls set for normal operation; no signal applied.

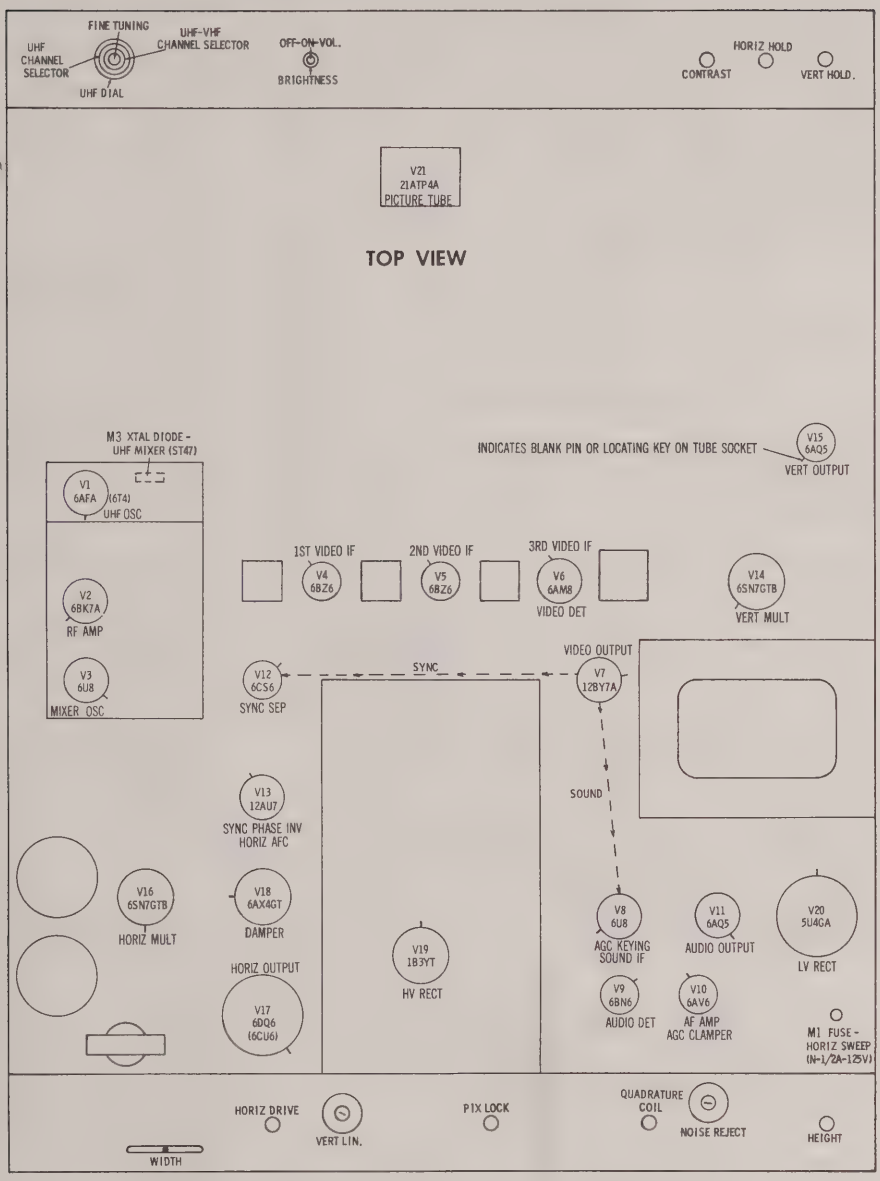


CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - **V20, Fuse (M1)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V3, V4, V5, V6, V7 (V1 UHF only)**
No pic, no sound, has snow - **V2, V3, V4**
No pic, has sound, has raster - **V7, V8, V21**
Has pic, no sound - **V8, V9, V10, V11**
Overloaded picture - **V8, V10**

SYNC FAILURE
No vert. sync - **V13, V14**
No horiz. sync - **V13, V16**
No vert. or horiz. sync - **V12, V13**

SWEEP FAILURE
No raster, has sound - **V16, V17, V18, V19, V21**
No vertical deflection - **V14, V15**
Poor vert. linearity or foldover - **V14, V15**
Poor horiz. linearity or foldover - **V16, V17, V18**
Narrow picture - **V16, V17, V18, V19, V20**
Vert. off freq. - **V13, V14**
Horiz. off freq. - **V13, V16**

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ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The shock hazard may be eliminated by removing the horizontal output tube (V17).

VIDEO IF ALIGNMENT

Remove the AGC keying tube (V8) from its socket. Connect the negative lead of a 3 volt battery to the ungrounded side of C37. Positive to chassis. Connect a clip lead from pin 5 of V10 to chassis. Use high sweep generator output to make trap adjustment A1, A2, and A6 visable on scope. Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.001MFD	High side thru .001MFD to pin 1 (grid) of 6BZ6 (V4). Low side to chassis.	44MC (10MC Swp)	41.25MC	Any	Vert. amp. thru 10K to point Ⓒ. Low side to chassis.	A1	Adjust for MINIMUM response at marker frequency.
2.	"	"	"	47.25MC	"	"	A2	"
3.	"	"	"	44.1MC	"	"	A3	Use only enough sweep generator output to provide usable pattern on scope. Adjust A3 for maximum marker amplitude with MINIMUM tilt.
4.	"	"	"	42.9MC	"	"	A4	Adjust A4 to position 42.9MC marker within 50% of maximum amplitude on response curve.
5.	"	"	"	45.3MC	"	"	A5	Adjust A5 to position 45.3MC marker within 50% of maximum amplitude on response curve. Repeat steps 1 thru 5.
6.	"	High side thru .001MFD to point Ⓐ (On back of tuner). Low side to chassis.	"	47.25MC	Any non-interfering channel.	"	A6	Adjust for MINIMUM response at 47.25MC marker.
7.	Two 120Ω carbon resistors	Across VHF antenna with 120Ω in each lead.	189MC (10MC Swp)	187.25MC 191.75MC	9	"		Adjust fine tuning until sound marker falls in trap (Fig. 1).
8.	"	"	"	"	"	Vert. amp. thru detector (Fig. 3). to pins 5 & 6 of 6BZ6 (V4). Low side to chassis.	A7, A8	Adjust A7 and A8 for response curve similar to Fig. 1. Adjust for maximum amplitude and MINIMUM tilt to position of video marker.
9.	Direct	High side to ungrounded tube shield floating over converter tube (V3). Low side to chassis.	44MC (10MC Swp)	41.25MC 42.25MC 45.75MC 47.25MC	Any non-interfering channel.	Vert. amp. thru 10K to point Ⓒ. Low side to chassis.		Check for response similar to Fig. 2. If necessary, SLIGHTLY retouch A3 thru A8 for desired response. A1 and A2 should not be retouched. Remove bias supply. Replace 6U8 (V8) and 6DQ6 (V17) in their sockets.

SOUND IF ALIGNMENT

Preset the noise rejection control (R6) 90° from maximum clockwise rotation. Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	.001MFD	High side to point Ⓒ. Low side to chassis.	Not used.	4.5MC (400∿ 50% mod.)	Any	Vert. amp. thru detector (Fig. 4) to pin 11 (cathode) of picture tube. Low side to chassis.	A9, A10	Connect a clip lead across terminals "C" and "D" of L8. Adjust A9 and A10 for MINIMUM 400∿ indication on scope.
11.	"	"	4.5MC (25KC Swp) (400∿ Mod)	Not used.	"	Vert. amp. to point Ⓑ. Low side to chassis.	A11	Adjust for maximum 400∿ indication on scope. Two peaks will be present. Adjust for the peak having the greater amplitude.
12.	"	"	"	"	"	"	A12, A10	Attenuate generator output so that the signal level is below the limiting level of the 6BN6 as evidenced by background hiss in the sound. Adjust A10 and A12 for maximum response on the scope.
13.	"	"	Not used.	4.5MC (400∿ Mod)	"	"	R6	Use high signal generator output and adjust R6 for MINIMUM 400∿ indication on scope.
14.	"	"	4.5MC (25KC Swp) (400∿ Mod)	4.5MC	"	"	A11	Retouch A11 for maximum 400∿ indication on scope. Use low generator output. Remove short from L8. Tune in the weakest station in the area and adjust R6 for MINIMUM buzz and hiss. Tune in the strongest station in the area and adjust A11 for clearest sound.

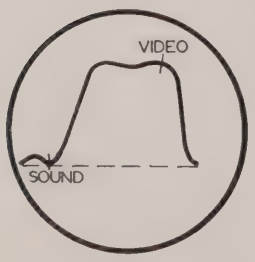


FIG. 1

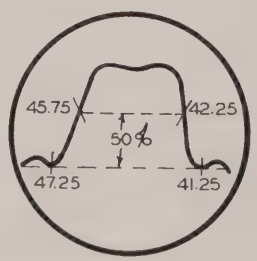


FIG. 2

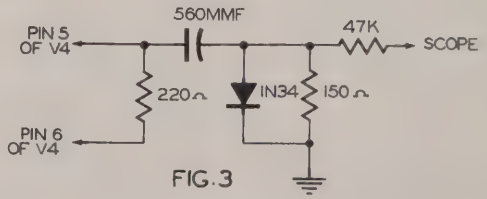


FIG. 3

ALIGNMENT INSTRUCTIONS (cont)

VHF OSCILLATOR ALIGNMENT

Leave bias connected as under "Video IF Alignment".
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Use only enough sweep generator output to provide usable pattern on scope.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
15.	Two 120Ω carbon resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211. 25MC 215. 75MC	13	Vert. amp. thru 10K to point (C). Low side to chassis.	A13	Adjust A13 to properly position markers on the curve as in Fig. 5.
16.	"	"	207MC (10MC Swp)	205. 25MC 209. 75MC	12	"		Check channels 12 thru 7 for proper marker locations as in Fig. 5. If necessary, SLIGHTLY retouch A13 for best compromise on all channels.
			201MC (10MC Swp)	199. 25MC 203. 75MC	11			
			195MC (10MC Swp)	193. 25MC 197. 75MC	10			
			189MC (10MC Swp)	187. 25MC 191. 75MC	9			
			183MC (10MC Swp)	181. 25MC 185. 75MC	8			
			177MC (10MC Swp)	175. 25MC 179. 75MC	7			
17.	"	"	85MC (10MC Swp)	83. 25MC 87. 75MC	6	"	A14	Adjust A14 to properly position markers on the curve as shown in Fig. 5.
18.	"	"	79MC (10MC Swp)	77. 25MC 81. 75MC	5	"		Check channels 5 thru 2 for proper marker position on the curve as in Fig. 5. If necessary, SLIGHTLY retouch A14 for best compromise on all channels.
			69MC (10MC Swp)	67. 25MC 71. 75MC	4			
			63MC (10MC Swp)	61. 25MC 65. 75MC	3			
			57MC (10MC Swp)	55. 25MC 59. 75MC	2			

VHF RF AND MIXER ALIGNMENT

The RF and Mixer portion of this receiver has been properly aligned at the factor and is very stable. Alignment of this portion is not recommended in the field.

UHF TUNER ALIGNMENT

In the event the UHF oscillator tube is replaced, it is recommended that several tubes be tried and the one which works best be used. Alignment of the UHF tuner should not be required in the field.

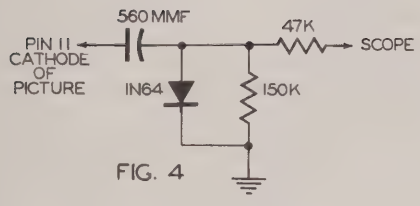


FIG. 4

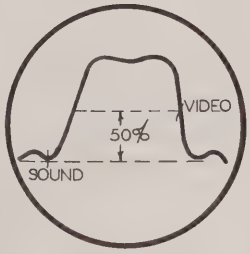
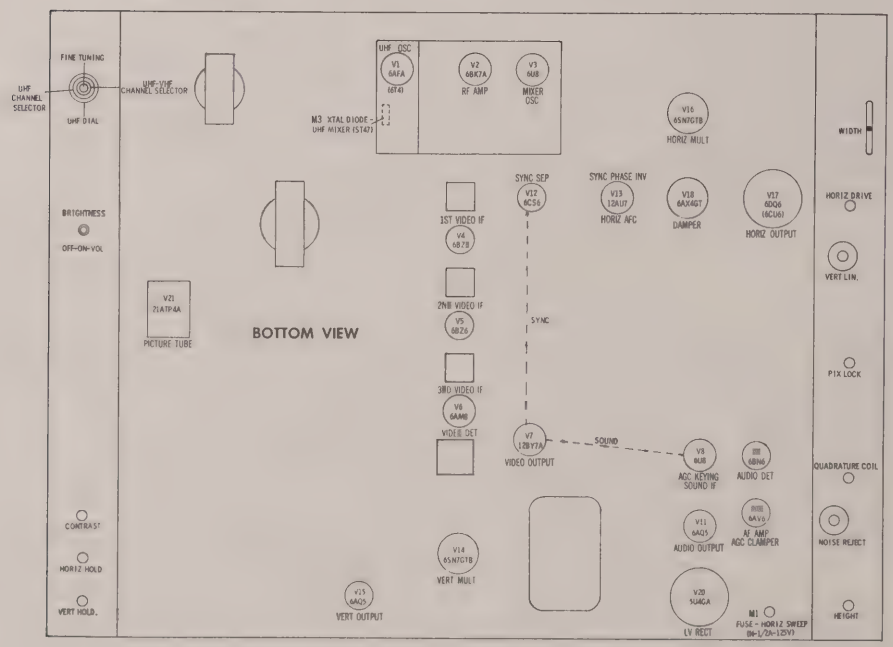


FIG. 5

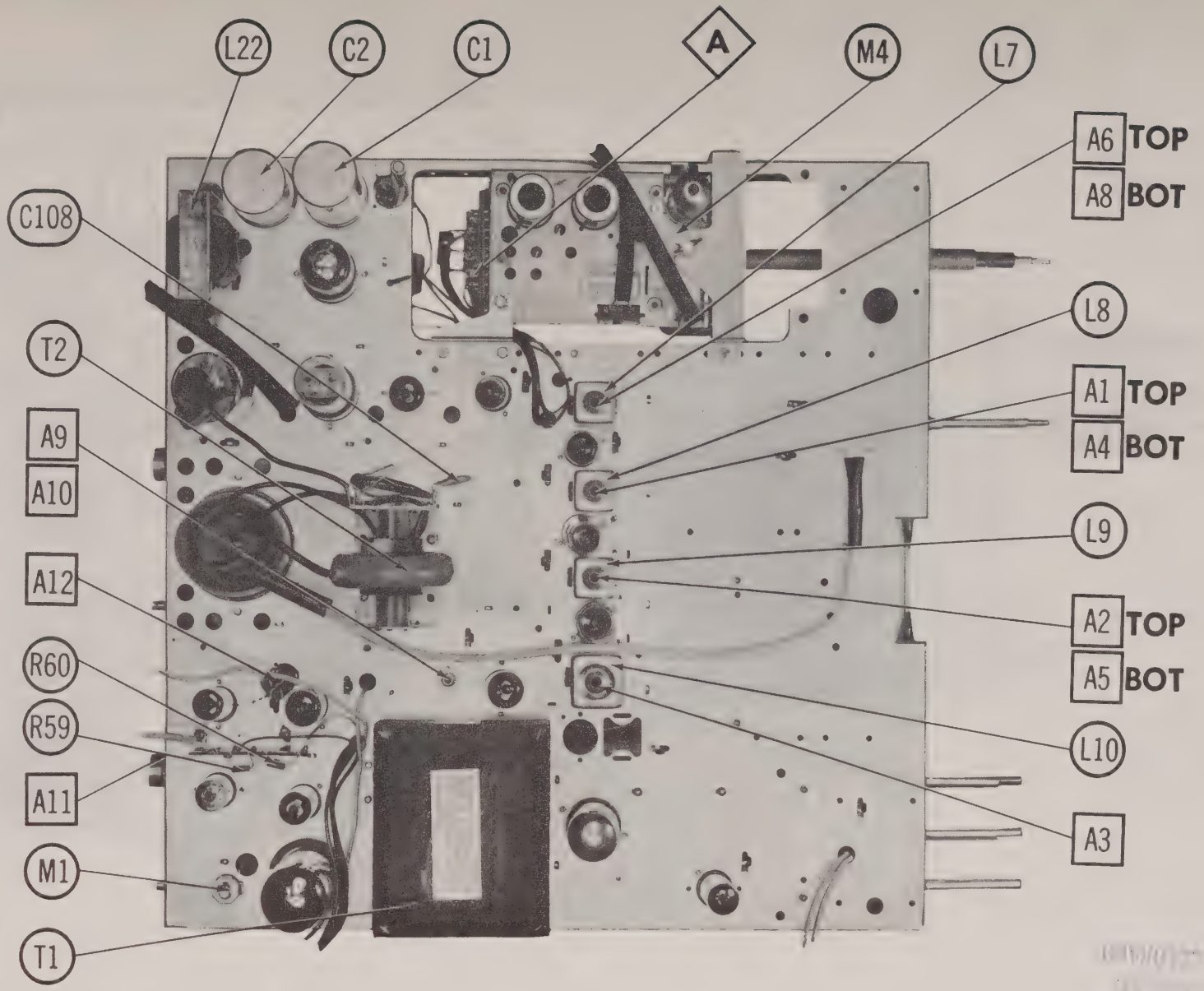
RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6AF4A	■ *4700Ω	6800Ω	.1Ω	0Ω	0Ω	6800Ω	■ *4700Ω		
V2	6BK7A	† 2400Ω	400K	INF	.1Ω	0Ω	INF	1Meg	0Ω	0Ω
V3	6U8	■ 1000Ω	470K	† 120K	.1Ω	0Ω	■ 1000Ω	0Ω	0Ω	15K
V4	6BZ6	60K	47Ω	.1Ω	0Ω	▲ 100Ω	▲ 100Ω	0Ω		
V5	6BZ6	100K	▲ 18Ω	.1Ω	0Ω	† 135Ω	† 135Ω	INF		
V6	6AM8	100Ω	.1Ω	† 400Ω	.1Ω	0Ω	† 2900Ω	1700Ω	6000Ω	0Ω
V7	12BY7A	39Ω	6000Ω	0Ω	.1Ω	.1Ω	0Ω	† 5000Ω	† 2900Ω	0Ω
V8	6U8	† 220K	† 40K	▲ 22K	† 60K	† 60K	600K	† 37Ω	15K	70K
V9	6BN6	● 350Ω	3.5Ω	0Ω	.1Ω	■ 22K	7.5Ω	† 330K		
V10	6AV6	10Meg	0Ω	0Ω	.1Ω	1Meg	1Meg	† 330K		
V11	6AQ5	470K	560Ω	.1Ω	0Ω	† 1100Ω	† 500Ω	470K		
V12	6CS6	30K	0Ω	0Ω	.1Ω	■ 150K	■ 22K	5Meg		
V13	12AU7	22K	350K	180K	† 60K	† 60K	† 14K	† 2Meg	■ 3900Ω	† 60K
V14	6SN7GTB	1Meg	† 220K	680Ω	●1.8Meg	▲ ●1.5Meg	680Ω	.1Ω	0Ω	
V15	6AQ5	2.2Meg	● 450Ω	.1Ω	0Ω	† 1000Ω	† 500Ω	2.2Meg		
V16	6SN7GTB	2.2Meg	† 8200Ω	1200Ω	●100K	† 120K	1200Ω	.1Ω	0Ω	
V17	6DQ6	TP	.1Ω	TP	† 6000Ω	1Meg	TP	0Ω	0Ω	Top Cap ▲ 10Ω
V18	6AX4GT	TP	NC	500K	NC	† 185Ω	TP	† 60K	† 60K	
V19	1B3GT	PINS 1 - 8 HAVE INFINITE RESISTANCE								Top Cap ▲ 350Ω
V20	5U4GA	TP	17K	TP	14Ω	TP	13Ω	TP	17K	
V21	21ALP4B	† 60K	■ 55K	Pin 6 0Ω	Pin 10 ▲ 22K	Pin 11 †● 500K	Pin 12 † 60K			

* MEASURED IN "UHF" POSITION.
■ MEASURED FROM 125V LINE.
▲ MEASURED FROM PIN 7 OF V5.
† MEASURED FROM PIN 8 OF V20.
▲ MEASURED FROM PIN 3 OF V18.
● THIS READING WILL VARY.
CONTROL SET FOR NORMAL OPERATION.
TP TIE POINT
NC NO CONNECTION



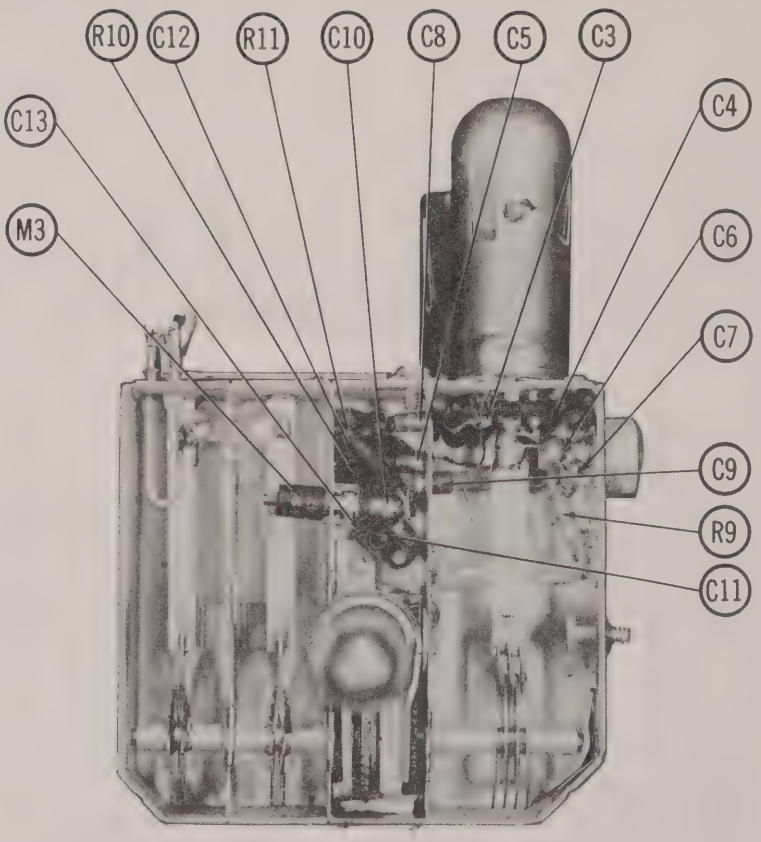
TUBE PLACEMENT CHART



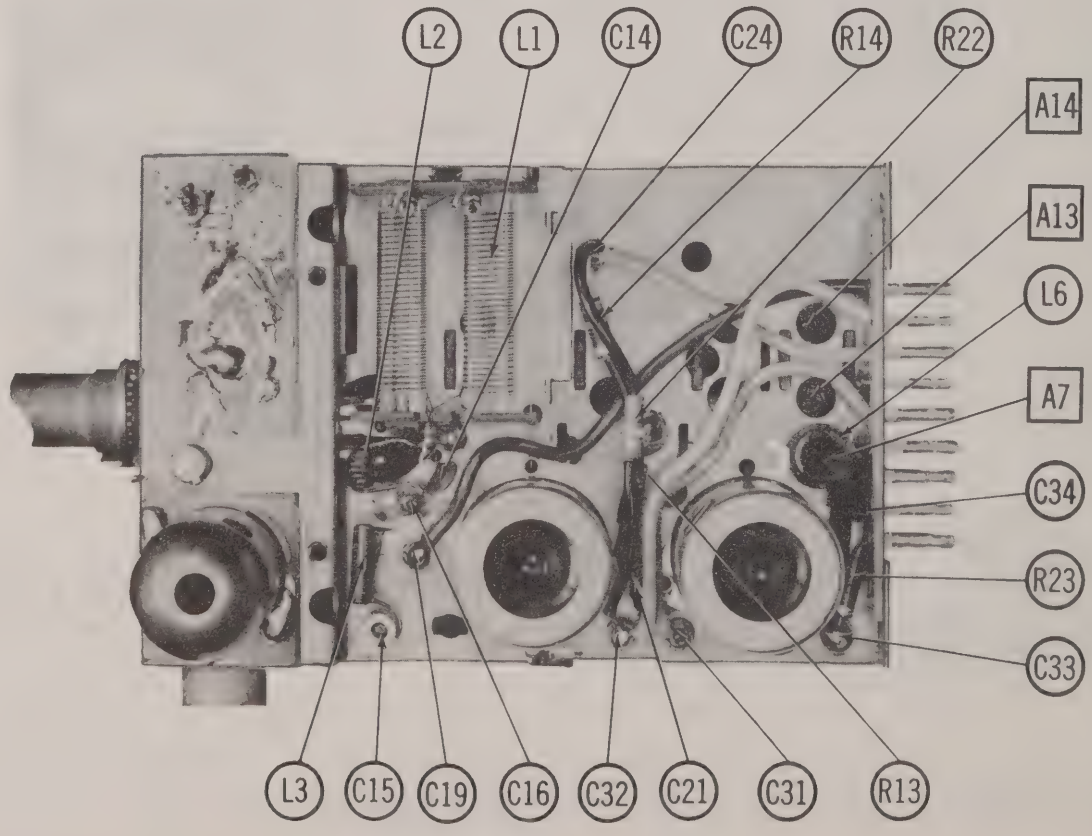
CHASSIS TOP VIEW

CX-385 SERIES

CAPEHART CHASSIS



UHF TUNER FRONT VIEW



RF TUNER TOP VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	UHF Osc.	6AF4A	Note 1
V2	RF Amp.	6BK7A	
V3	Mixer-Osc.	6U8	
V4	1st Video IF Amp.	6BZ6	
V5	2nd Video IF Amp.	6BZ6	
V6	3rd Video IF Amp. - Video Det.	6AM8	
V7	Video Output	12BY7A	
V8	AGC Keying - Sound IF Amp.	6U8	
V9	Audio Det.	6BN6	
V10	AF Amp. -AGC Clamper	6AV6	
V11	Audio Output	6AQ5	
V12	Sync Sep.	6CS6	
V13	Sync Phase Inv. - Horiz. AFC	12AU7	
V14	Vert. Mult.	6SN7GTB	
V15	Vert. Output	6AQ5	
V16	Horiz. Mult.	6SN7GTB	
V17	Horiz. Output	6DQ6	Note 2
V18	Damper	6AX4GT	
V19	HV Rectifier	1B3GT	
V20	LV Rectifier	5U4GA	

Note 1. 6T4 may be used in some versions.
Note 2. 6CU6 may be used in some versions.

PICTURE TUBE

ITEM No.	REPLACEMENT DATA				NOTES
	CAPEHART PART No.	CBS PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	
V21	21ALP4B ①	21ALP4B ①	21ALP4A/B ①	21ALP4A/B ②	① Aluminized
		21ALP4A ①	21ALP4A ①		② Silver Scfeen "85"
		21ALP4	21ALP4		
	21ATP4 ①	21ATP4 ①	21ATP4 ①	21ATP4A ②	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	CAPEHART PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲50	350	850352A-1	AFH4-56-05	D062	FP420. 47	TMT-29	Q-415	R2178 *
B	▲20	350			BR4035		TD-100-50	FM-4520	
C	■40	350							
D	100	50							
C2A	▲50	350	850352A-2	AFH4-96	D102	FP444. 5	TMQ-114	Q-015	R2179 *
B	20	200				TC51		FM-2508	
C	▲8	250							
D	■30	350							

* Non-catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	CAPEHART PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	170									
C4	170									
C5	1000			EF-001	MFT-1000				503C-D1	
C6	1-4									
C7	1. 5									
C8	1000			EF-001	MFT-1000				503C-D1	
C9	1. 1									
C10	3. 3									
C11	1000			BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C12	1000			BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C13	15									
C14	150		471765A-1	NP0-D1150	TCZ-150	TZ34	NP0-334-151	ZT-5315	5TCC-T15	
C15	5-10		471766A-1		829-10					
C16	15									
C17	15		451759A-1	NP0-D115	TCZ-15	Z021	NP0K-150		5TCC-Q15	
C18	4		451758A-1							
C19	1000		45131IA-1							
C20	3. 3		650030A-5	NP0-SI3. 3	TCZ-3R3	TZ06	NP0A-3R3	ZT-5533	5TCCB-V33	
C21	1000		45131IA-1							
C22	1000			BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C23	12		451764A-1		TCZ-12	TZ10	NP0K-120			
C24	1000									
C25	3. 9									
C26	1. 2		451760A-1							
C27	15		451759A-1	NP0-D115	TCZ-15	Z021	NP0K-150		5TCC-Q15	
C28	1. 2		451760A-1							
C29	1. 5		451762A-1							
C30	10		451063A-1							
C31	1000		45131IA-1							
C32	1000		45131IA-1							
C33	1000		45131IA-1							
C34	15			NP0-D115	DD-102	Z021	NP0K-150		5TCC-Q15	
C35	1000		45131IA-1							
C36	. 22	200	2246-2240	P288N-22		CUB2P22		PT4022	2TM-P22	
C37	. 22	200	2246-2240	P288N-22		CUB2P22		PT4022	2TM-P22	
C38	1000		450469A-5	BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C39	470		450469A-11	BPD-00047	DD-471	K060	811-471	UC-5347	5GA-T47	
C40A	470	}	650858A-1	BPD-00047	DD-471	K060	811-471	UC-5347	5GA-T47	
B	470	}		BPD-0047	DD-471	K060	811-471	UC-5347	5GA-T47	
C41	. 1	400	2247-1040	P488N-1	DF-104	CUB4P1		PT401	4TM-P1	
C42	1000		450469A-5	BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C43	1000		450469A-5	BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C44	470		450469A-11	BPD-00047	DD-471	K060	811-471	UC-5347	5GA-T47	
C45	470		450469A-11	BPD-00047	DD-471	K060	811-471	UC-5347	5GA-T47	
C46	1000		450469A-5	BPD-001	DD-102	K069	801-001	DC521	5HK-D1	Note 1
C47	1000		450469A-5	BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C48	5		650030A-1	NP0-D15	TCZ-4R7	Z011	NP0A-050	ZT-555	5TCCB-V47	
C49	1000		450469A-5	BPD-001	DD-102	K069	801-001	DC521	5HK-D1	Note 2
C50	1000		450469A-5	BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C51	47		650030A-17	N750-SI47	TCN-47	N033	N750K-470	NT-5447	5TCU-Q47	
C52	1000		450469A-5	BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C53	5000		450469A-12	BPD-005	DD-502	K080	811-005	DC525	5HK-D5	
C54	47		650030A-17	N750-SI47	TCN-47	N033	N740K-470	NT-5447	5TCU-Q47	
C55	. 1	400	2247-1040	P488N-1	DF-104	CUB4P1		PT401	4TM-P1	
C56	. 1	400	2247-1040	P488N-1	DF-104	CUB4P1		PT401	4TM-P1	
C57	. 0022	600	2248-2220	BPD-0022	D6-222	CUB6D22	GP2-333-222	PT6222	6TM-D22	

CAPACITORS (cont)

ITEM No.	RATING CAP	RATING VOLT	REPLACEMENT DATA CAPEHART Part No.	ARROVOX Part No.	CENTRALAB Part No.	CORNELL DUBILIER Part No.	ERIE Part No.	MALLORY Part No.	SPRAGUE Part No.	NOTES
C88	.022	600	2346-3220	BPD-03	DF-303	CUD6n23		PT6123	8TM-S22	
C88	.0027	1000	3249-3724		DD30-272					
C88	.01	600	2346-3200	BPD-01	D6-103	CUD6S1	GP3-103 103	PT6L	4TM-S1	
C88	.22	200	2349-2340	P348P-22		CUB2P22		PT4122	2TM-P22	
C92	3 3		6300?0A-5	KPD-6S3.3	TC2E-3R3	Z00J	NP0A-3R3	ZT-5S3	5TCCR-V3	
C93	47		6300?0A-47	NT50-S47	TCM-47	N033	NT50K-470	NT-5447	5TCU-Q47	
C94	3 9		6300?0A-39							
C96	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C96	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C97	10		6300?0A-18							
C 98	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C 98	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C70	1000		4300?6A-8	BPD-001	DD-102	K0S9	S0J-001	DC5J	5HK-D1	
C71	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C72	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C73	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C74	1000		4300?6A-8	BPD-01	DD-102	K0S9	S0J-001	DC5J	5HK-D1	
C75	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C76	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C77	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C78	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C79	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C80	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C81	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C82	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C83	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C84	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C85	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C86	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C87	10000		4300?6A-13	BPD-01	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C99	1	600	2347-1040	P448N-1	DF-104	CUD4P1		PT401	4TM-P1	
C99	.047	600	2347-4720	BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C99	13000		?4538A-A3	BPD-001	D6-104		GP3L-103	PT631	6TM-D1	
C99	001	600	2349-1020	BPD-001	DD-102		GP3-102	PT610	6TM-D1	
C99	1000			BPD-0033	D6-332	K0S7	S1J-0033	DC5J	5HK-D33	
C99	00000		4300?6A-13	BPD-03	DD-103	K0S2	S1J-01	DC5IJ	5HK-S5	
C94	1	600	2346-1040	P448N-1	DF-104	CUB4P1		PT401	4TM-P1	
C95	1	600	2347-1040	P448N-1	DF-104	CUB4P1		PT401	4TM-P1	
C96	1	600	2347-1040	P448N-1	DF-104	CUB4P1		PT401	4TM-P1	
C87	0047	600	2348-4720	BPD-0047	D6-472	CUB6D47	GP3-333-472	PT6247	6TM-D47	
C84	0047	600	2348-4720	BPD-0047	D6-472	CUB6D47	GP3-333-472	PT6247	6TM-D47	
C89	.033	600	2347-3320	BPD-03	DF-303	CUB4S33	617-02	PT4122	4TM-S22	
C90	470	500		NPO-S270	D6-271	SR5T27	811-271		MS-S27	
C91	470	500		NPO-S470	D6-471	SR5T47	811-471		MS-S47	
C92	470	500	2372-2147	1464-00547	D6-471	SR5T47	811-471		MS-S47	
C93	470	500	2372-2147	1464-00547	D6-471	SR5T47	811-471		MS-S47	
C94	470	500	2372-2147	1464-00547	D6-471	SR5T47	811-471		MS-S47	
C94	.047	600	2347-4720	BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C105	1		2347-1040	P448N-1	DF-104	CUB4P1		PT401	4TM-P1	
C109	1	600	2347-1040	P348N-1	DF-104	CUB4P1		PT401	4TM-P1	
C107	.047	600	2347-4720	BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C108	56		4309?5A-9			DD30-560	3XV-580	DC30456		
C109A	.500	1000	4535?2A-4	BPD-2X0015	DD3-152	DK0T	S1J-0015	DCD5J5	5HK-ED15	
B	.500	1000								

† Items C79, R18A and R84B are combined in one unit.
Note 1: Some versions may use 4?3EM3F unit (part #4304?8A-1) in this application.
Note 2: Not used in chassis coded R-1.
Note 3: Chassis coded R-1 uses .01MFD unit (Part #2348-1020) in this application.

CONTROLS

ITEM No.	RATING RESIST ANCE	WATTS	REPLACEMENT DATA CAPEHART Part No.	CENTRALAB Part No.	CAROSTAT Part No.	IRC Part No.	MALLORY Part No.	INSTALLATION NOTES
R1A	1. 5Meg		6300?6A-1	F1-R4			UF1551	Volume (Rear) Note 1
B	300K			R2-S3			UR254A	Switching (Panel)
C	Switch			K3-1			US-28	Attach to R1B
R2A	15K		6300?4A-10	ABT-154		Q17-118X		Contrast Tapped at 10K
B	Shaft		Not Req.	AK-8		NQ		Attach to R2A
R3A	100K		6300?4A-31	B-40	A47-100K-G	Q1-128	U41	Horiz Hold
B	Shaft		Not Req.	Not Req.	F9-3	Not Req.	Not Req.	Attach to R3A
R4A	1Meg		6300?4A-15	AB-162	A47-1.0Meg-G	Q11-239	U155	Vert. Hold
B	Shaft		Not Req.	AK-3	F9-3	Not Req.	Not Req.	Attach to R4A
R5A	2. 5Meg		6300?7A-1	BX-83	A47-2.5Meg-G	Q11-239	SU-585	Height
B	Shaft		Not Req.	Not Req.	FK3-1, 4	Not Req.	Not Req.	Attach to R5A
R6	650Ω	3	6300?4A-12		39-700-200			Noise Rejection 150Ω stop
								Wire-wound
R7A	2. 5Meg		6300?7A-1	BX-83	A47-2.5Meg-G	Q11-239	SU-585	Picture Lock
B	Shaft		Not Req.	Not Req.	FK3-1, 4	Not Req.	Not Req.	Attach to R7A
R8	1300Ω	2	6300?4A-14		139-1500			Vert. Linearity 250Ω stop
								Wire-wound

† Connect a 270Ω resistor in series with the lead connecting to the terminal of the control.
R3 and R4 are replaced with a dual concentric control part no. 6300?6A-3 on the deluxe chassis.
Note 1: Some versions will use an alternate control part no. 6300?6A-11 in this application.
* Universal Replacement (Mallory exact duplicate part no. UR128?0)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	WATT	REPLACEMENT DATA CAPEHART Part No.	IRC Part No.	NOTES
R9	680Ω			BTS-680	
R10	1000Ω			BTS-1000	
R11	150Ω			BTS-150	
R13	47K		3229-473	BTS-47K	
R13	1Meg		3229-105	BTS-1Meg	Note 1
R14	750K		3229-754	BTS-750K 5%	
R15	470K		3229-474	BTS-470K	
R16	68000 5%		3228-683	BTS-6800 5%	
R17	10K		3229-103	BTS-10K	
R18	15K		3229-153	BTS-15K	
R18	150K		3229-154	BTS-150K	
R20	12K			BTS-12K	
R21	12K			BTS-12K	
R23	130K		3229-142	BTS-130K	
R24	1000Ω		3229-102	BTS-1000	
R24	37500Ω		3229-373	BTS-37500	
R25	3300Ω	2		BTB-3300	
R26	4. 7Meg 5%		3228-475	BTS-4. 7Meg 5%	
R27	82K	1	3252-823	BTA-82K	
R28	10K		3252-103	BTS-10K	
R29	680K 5%		3228-634	BTS-680K 5%	

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS (cont)

ITEM No.	RATING OHMS	WATT	REPLACEMENT DATA CAPEHART Part No.	IRC Part No.	NOTES
R52	33000	2	6302?2A-7	BTB-3300	
R53	33000	2	6302?2A-7	BTB-3300	
R54	32000		3229-322	BTS-3200	
R55	82K		3229-823	BTS-82K	
R56	220K		3229-224	BTS-220K	
R57	22K		3229-223	BTS-22K	
R58	33K		3229-333	BTS-33K	
R59	1Meg		3229-105	BTS-1Meg	
R60	1Meg		3229-105	BTS-1Meg	
R61	56K		3229-563	BTS-56K	
R62	220K		3229-224	BTS-220K	
R63	6800	5%	3228-682	BTS-6800 5%	
R64	330K		3229-334	BTS-330K	
R65	22K		3229-223	BTS-22K	
R66	560K		3229-564	BTS-560K	
R67	82K		3229-563	BTS-82K	
R68	10Meg		3229-106	BTS-10Meg	
R69	330K		3229-334	BTS-330K	
R70	470K		3229-474	BTS-470K	
R71	560Ω	1	3252-561	BTA-560	
R72	470Ω	1	3252-471	BTA-470	
R73	470K		3229-474	BTS-470K	
R74	10K		3229-103	BTS-10K	
R75	22K		3252-223	BTA-22K	
R76	5. 6Meg		3229-565	BTS-5. 6Meg	
R77	560K		3229-564	BTS-560K	
R78	220K		3229-224	BTS-220K	
R79	2. 2Meg		3229-225	BTS-2. 2Meg	
R80	10K		3229-103	BTS-10K	
R81	33000		3229-332	BTS-33000	
R82	33000		3229-332	BTS-33000	
R83	22K		3229-223	BTS-22K	
R84			4532?4A-1		
R85	1Meg		3229-105	BTS-1Meg	Note 2
R86	330K	1	3252-334	BTA-330K	

ITEM No.	RATING OHMS	WATT	REPLACEMENT DATA CAPEHART Part No.	IRC Part No.	NOTES
R87	1Meg		3229-105	BTS-1Meg	
R88	1. 2Meg		3229-125	BTS-1. 2Meg	
R89	6800	5%	3228-682	BTS-6800 5%	
R90	470Ω		3229-474	BTS-470K	
R91	1Meg		3229-105	BTS-1Meg	
R92	1Meg		3229-105	BTS-1Meg	
R93	2. 2Meg		3229-225	BTS-2. 2Meg	
R94	56K	1	3252-563	BTA-56K	
R95	1Meg		3229-105	BTS-1Meg	
R96	470Ω	1	3252-471	BTA-470	
R97	680Ω				
R98	560Ω				
R99	82K		3229-823		
R100	82K		3229-823		
R101	33K		3229-333		
R102	180K		3229-184		Note 3
R103	82K		3252-823		
R104	2. 2Meg		3229-225		
R105	6200Ω	1	3252-622		
R106	1200Ω		3229-122		
R107	47K		3229-473		
R108	12K		3229-124		
R109	10K		3229-103		
R110	120K	5%	3228-624		
R111	1Meg		3229-105		
R113	50000	?	6300?A-46	PW7-5000	
R114	22K		3229-223	BTS-22K	
R115	150Ω	?	6300?A-47	PW7-150	
R116	1. 8Ω			BW1-1. 8	
R117	220Ω		3229-221	BTS-220	
R118	100K		3229-104	BTS-100K	
R119	180K		3229-184	BTS-180K	
R120	330K		3229-334	BTS-330K	
R121	15K	3	3336-153	BTB-15K	Note 2

† Items R84A, R84B, CT9 are combined in one unit.
Note 1: In chassis coded R-1 a 22K resistor is used in this application.
Note 2: When R44 is 3300Ω, TW and R49 is 2200Ω, 2W wired in series, they will be parallel with a 12K, 2W resistor.
Note 3: In chassis coded R-1 a 100K resistor is used in this application.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	SEC. 1	SEC. 2	SEC. 3	REPLACEMENT DATA CAPEHART Part No.	Halldorson Part No.	Merit Part No.	Stancor Part No.	Thordorson Part No.	Triad Part No.
T1	117VAC	550VCT	5V	6. 3V	8603?A-1	P-9730	P-8320 ②	P8333 ②	32H200 ②	R-6HC ②
	① 1. 8A	②. 370A	③ 2A	④ 5. 9A						
				SEC. 4						
				⑤ 5V						
				⑥ 2. 5A						

① Parallel and phase 6. 3V, 1. 8A and 6. 3V, 1. 8A windings.
② Parallel and phase 6. 3V, 1. 2A and 6. 3V, . 9A windings.
③ Drill new mounting holes.
④ Parallel and phase 6. 3V, 6A and 6. 3V, 1. 25A windings.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA CAPEHART Part No.	Halldorson Part No.	Merit Part No.	RCA TYPE No.	Ram Part No.	Stancor Part No.	Thordorson Part No.	Triad Part No.
T2	Horiz. Output Trans.	8603?5A-1	FS-41B & RF600-1 ①	HVG-3K ②	235T1 & 214R1 ①	X094 ①	A-8255 & WC-5* ①	FLY-16 & WC-20* ①	D-50 & WC-11* ①
T3	Vert. Output Trans.	7303?4C-3	21900 ①	A-2823		V307	A-8144	25872	A-108X
T4A	Yoke (90°)	8603?4B-1 ④	DF507 ①	MDF-02 ①	235D1 ①	Y90F1 ①	43/DY-16A ①	Y-16 ①	Y-41-1 ①
B	Vert. (37MH)	8503?4A-4 ②							
T5A	Width Coil (45-5. 4MH)	8513?0A-1	RF600 ①	MWC-1 ③	214R1 ①	20UR14 ①	WC-5 ①	WC-20 ①	WC-11 ①
B	Width AGC-AFC Sec. (5. 4-14MH)	4531?8B-2 ①							

① Drill new mounting hole(s).
② Alternate Capehart part number.
③ Use 9 to 1 turns ratio.
④ Includes resistors R91 and R98.
⑤ Use original rear cover and centering device.
⑥ Use original horiz. yoke damping network.
⑦ Width coil core.
⑧ Use original slider and core.
⑨ Jumper terms. #2 & #4, then connect term #1 to term #7 in H. O. T., connect jumpered terms #3 & #4 to term #5 of H. O. T., connect term #3 to AGC & AFC circuits.
⑩ Jumper red & black terms, then connect blue term to term #1 of H. O. T., connect jumpered red & black terms to term #5 of H. O. T., connect orange term to AGC & AFC circuits.
⑪ Jumper terms "A" & "C", then connect term "B" to term #1 of H. O. T., connect jumpered terms "A" & "C" to term #5 of H. O. T., connect term "E" to AGC & AFC circuits.
⑫ Connect inner winding across terms #5 & #1 of H. O. T., connect outer winding from term #5 of H. O. T. to AGC & AFC circuits. If necessary, reverse inner and outer winding connections until pulse of required amplitude & polarity is obtained at plate of V5A, AGC keyer.
⑬ Jumper terms #1 & #4, then connect term #3 to term #1 of H. O. T., connect jumpered terms #1 & #4 to term #5 of H. O. T., connect term #3 to AGC & AFC circuits.
§ This part may be superseded by Parts Manufacturer's introduction of special unit for this application.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type is Listed

	ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordorson Replacement Connections	Triad Replacement Connections
	4	9	9	9	9	8	9	9
	9	7	7	7	7	1	7	7
	7	6	6	6	6	7	6	6
	8	N. C. See Note ⑫	N. C. See Note ⑫	N. C. See Note ⑫	N. C. See Note ⑫	N. C. See Note ⑫	N. C. See Note ⑫	N. C. See Note ⑫
	5	Jumper 1 & 2	3	Jumper 1 & 2	3	3	3	3
	1	6	1	8	1	4	1	1
Connect Width Coil Wires to:	5 & 1	Use RF600 see note ⑤	8 & 6	Use 214R1 See note 16	2 & 6	Use WC-5 See note 17	Use WC-20 See note 18	Use WC-11 See note 19
Special Notes:		④ ⑤	④	④	④	④ ⑰	④ ⑱	④ ⑲

④ Install damping network consisting of approximately 100MMF @ 2KV & 100Ω, 1W connected in series across horizontal yoke terms #3 & #1.
⑤ Jumper terms #3 & #4 of RF600, then connect term #1 of RF600 to term #1 of H. O. T., connect jumpered terms #2 & #4 of RF600 to term #3 of H. O. T., connect term #3 to AGC & AFC circuits.
⑯ Jumper terms "A" & "C" of 214R1, then connect term "E" of 214R1 to term #1 of H. O. T., connect jumpered terms "A" & "C" of 214R1 to term #5 of H. O. T., connect term "B" of 214R1 to AGC & AFC circuits.
⑰ Jumper red & black terms of WC-5, then connect blue term of WC-5 to term #4 of H. O. T., connect jumpered red & black terms of WC-5 to term #3 of H. O. T., connect orange term of WC-5 to AGC & AFC circuits.
⑱ Jumper terms #1 & #4 of WC-20, then connect term #3 of WC-20 to term #1 of H. O. T., connect jumpered terms #1 & #4 of WC-20 to term #3 of H. O. T., connect term #3 of WC-20 to AGC & AFC circuits.
⑲ Jumper red & black terms of WC-11, then connect blue term of WC-11 to term #1 of H. O. T., connect jumpered red & black terms of WC-11 to term #3 of H. O. T., connect orange term of WC-11 to AGC & AFC circuits.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI	SEC	CAPEHART Part No.	Halldorson Part No.	Merit Part No.	Stancor Part No.	Thordorson Part No.	Triad Part No.	NOTES
T6	6. 5K	3.4Ω	6513?A-1	22007	A-3020	A-3849	24881	S-52	

SPEAKER

ITEM No.	RATINGS SIZE	FIELD	V. C. IMP	REPLACEMENT DATA CAPEHART Part No.	QUAM Part No.	RCA TYPE No.	NOTES
SP1	6 X 9	PM	3-4Ω	7507?3A-1 ①	6A2	23S1	① Used in models 1C816MD-4, 1C816MD-5,
SP2	4"	PM	3-4Ω	7507?2A-1 ①	4A07	22S1	1C2316D-4 and 1C2316D-5.
SP3	4"	PM	3-4Ω	7507?2A-1 ①	4A07	22S1	② Used in models 2T816MD-4, 2T816MD-5,
	4 X 6	PM		7506?2A-1 ②			2T2316D-4, 2T2316D-5, 8T816MD-4, 8T816MD-5,
	3"	PM		6510?7A-1 ②			8T2316D-4, 8T816D-5, 1C816MD-4, 1C816MD-5,
	3"	PM		6510?6A-2 ②			1C2316D-4, 1C2316D-5, 1C2316FD-4 and
							1C2316FD-5.

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA CAPEHART Part No.	MEISSNER Part No.	MERIT Part No.	MILLER Part No.	NOTES
L1	VHF Ant. Match. Trans.	. 6Ω	. 8Ω	4515?1 -1				
L2	IF Trap	0Ω		4517?6A-1				
L3	IF Trap	. 1Ω		4517?6A-1				
L4	Pix. Choke	0Ω		4517?0A-1				
L5	RF Choke	0Ω		4517?7A-1				
L6	Conv. Plate	. 3Ω	0Ω	4517?7A-1				
L7	1st Video IF	. 1Ω		7507?3B-1				Includes 47. 25MC trap.
L8	2nd Video IF	. 1Ω	. 1Ω	7507?3B-1	17-5003*	TV-137*	6333*	Includes 41. 25MC trap.
L9	3rd Video IF	. 1Ω	. 1Ω	7507?3A-1	17-5003*	TV-138*	6333*	Includes 47. 25MC trap.
L10	4th Video IF	. 3Ω	. 3Ω	7506?3B-1				L7, L8, L9, L10 resistors
L11	RF Choke	1. 8Ω		6503?8A-4				3. 3 Microhenries,
								10% part #CLA
L12	Series Peaking Coil	13Ω		7505?7A-1			4606	180 Microhenries, wound on 10K, 1W resistor
L13	Series Peaking Coil	8. 3Ω		4503?8A-5			4623	10 Microhenries, 10% part #CL-1.
L14A	4. 5MC Trap	1. 8Ω		6509?9A-1				
B	1st Sound IF	3Ω						
L15	Series Peaking Coil	5. 3Ω		7505?7A-3		TV-184*	6180*	140 Microhenries, wound on 5. 6K resistor
L16	Shunt Peaking Coil	5. 5Ω		7505?7A-4		TV-184	6154	200 Microhenries
L17	Series Peaking Coil	4. 6Ω		7507?7A-3		TV-184*	6177*	100 Microhenries, wound on 2. 2K resistor (Tapped @ . 5Ω and 1Ω
L18	2nd Sound IF Quadrature Coil	6Ω		6504?8B-1				
L19	2nd Sound IF Coil	7. 5Ω		6507?6A-1	20-1005		1680	
L20	RF Choke	3Ω		4503?8A-7				3. 3 Microhenries, 10% part #CLA

* Use adapter plate.
● Parallel with 10K, 1W resistor.
▲ Parallel with 2. 2K resistor.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES PRI.	DC RES SEC.	REPLACEMENT DATA CAPEHART Part No.	MEISSNER Part No.	MERIT Part No.	MILLER Part No.	RCA TYPE No.	Ram Part No.	Thordorson Part No.	NOTES
L21	58Ω		8504?7B-1	18-1578	TV-183	6330			R8-8	

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE @ CURRENT (000 °C)	REPLACEMENT DATA CAPEHART Part No.	Halldorson Part No.	Merit Part No.	Stancor Part No.	Thordorson Part No.	Triad Part No.
L22	370A	37Ω	L. 8HY	6511?A-1	C-9031 ①	C-3991	C-3336 ①	30C44	C-17X ①

PARTS LIST AND DESCRIPTIONS (Continued)

FUSES

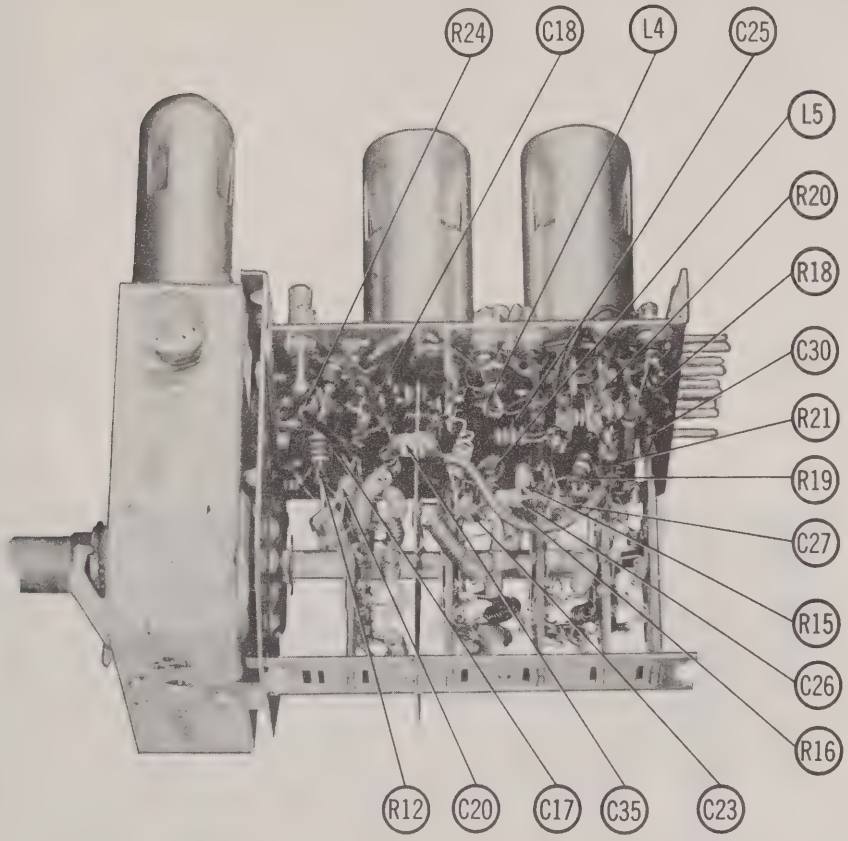
ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			CAPEHART PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	N	½A 125V	651137A-1		333.500 (N½A)	346009	N½	HN 3/10-1/2
M2	1" piece #26 wire							

CRYSTAL DIODES

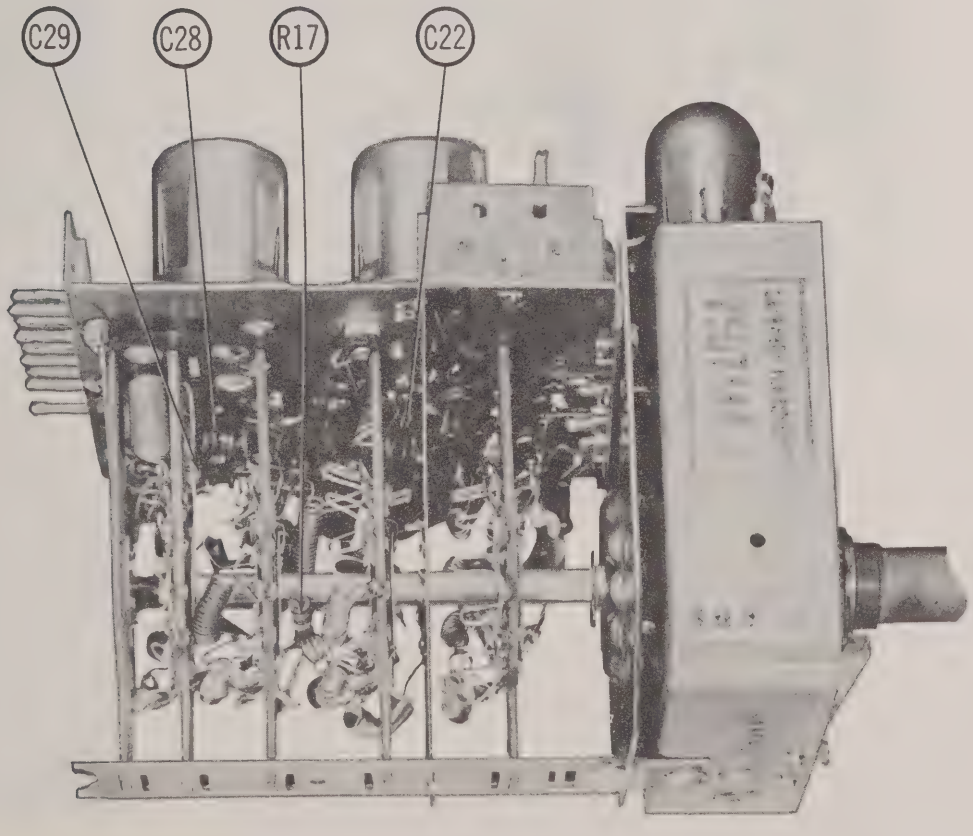
ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		CAPEHART PART No.	SYLVANIA PART No.	
M3	ST-47		1N82 or 1N82A	UHF Mixer (clip in). Used in models with suffix -5.

MISCELLANEOUS

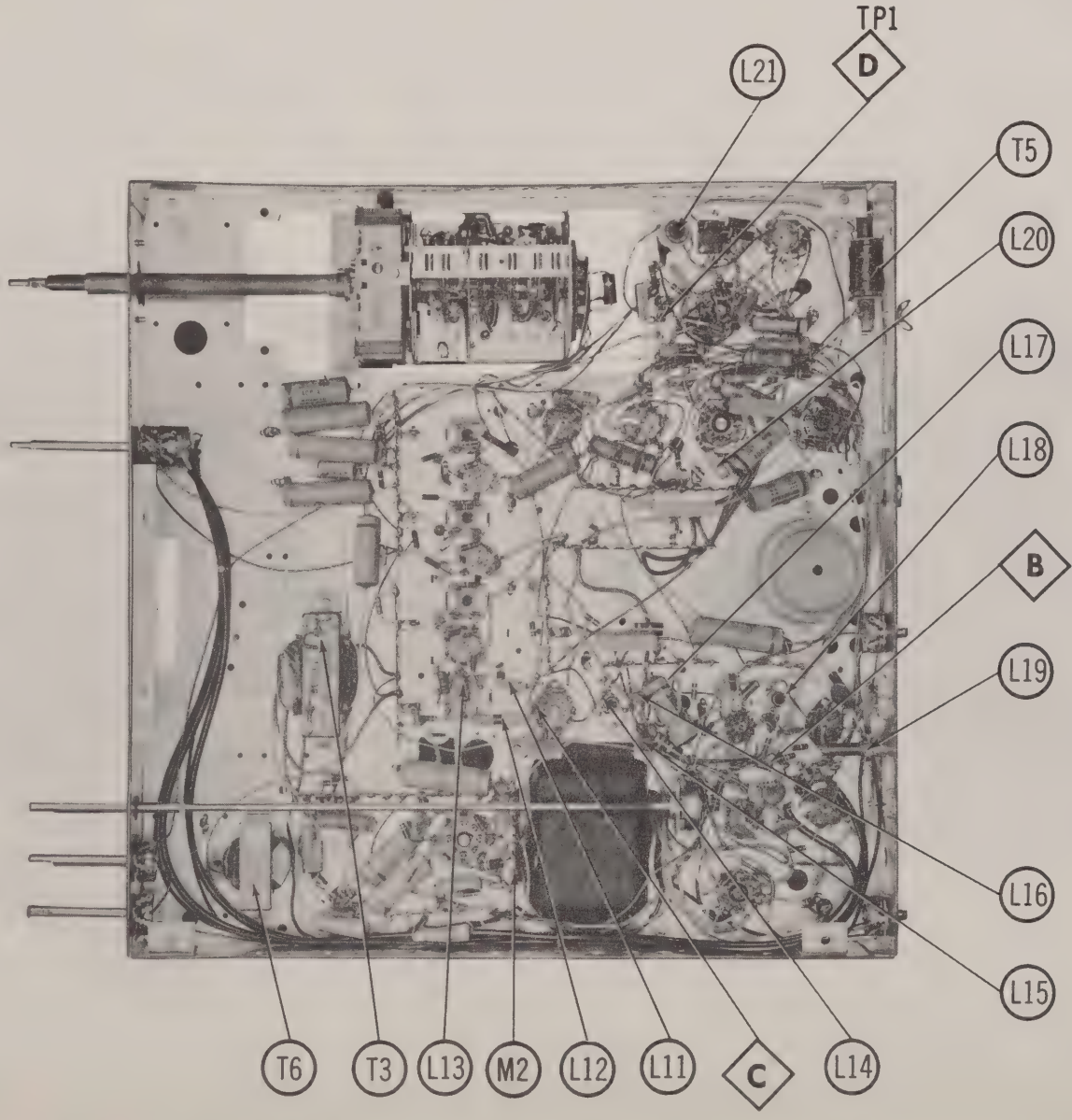
ITEM No.	PART NAME	CAPEHART PART No.	NOTES
M4	Tuner	750745A-G1	VHF-UHF Combination - Used in models with suffix -5. Combination tuner consists of VHF tuner (part #850374A-1) & UHF tuner (part #750744A-1). VHF tuner only used in models with suffix -4.
M5	Centering Device		Part of deflection yoke (T4) rear cover.
M6	Ion Trap	750724A-6	
B2	Trimmer Cap.	450527B-1	Horiz. Drive (40-370MMF)
	Knob	651120A-1	Brightness
	Knob	651115A-1	VHF Fine Tuning & On-Off-Volume
	Knob	651117B-1	VHF Channel Selector (VHF models only)
	Knob	651118B-1	VHF Channel Selector (VHF-UHF models)
	Knob	651119A-1	UHF Dial
	Knob	651116A-1	UHF Tuning
	Knob	651174A-1	Secondary - 3T & 11C models only.
	Safety Glass	850223A-14	
	Mask	950319B-4	
	Mask	950341A-1	Perforated Decorative - 6T & 16C models only.



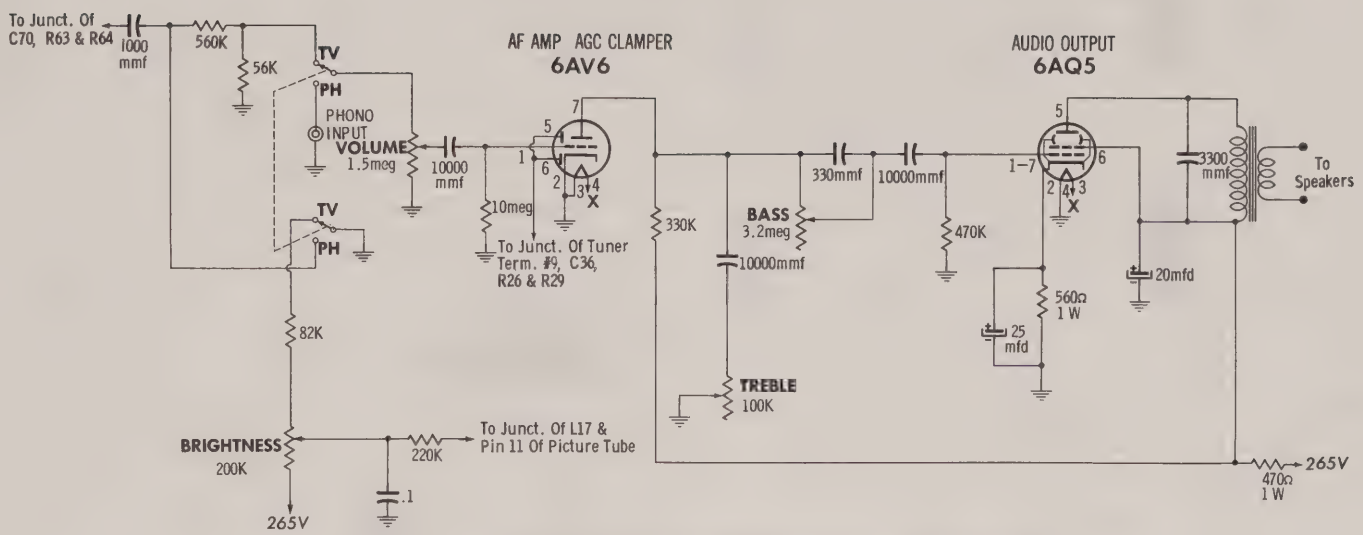
RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION



Audio Circuits & Brightness Control Connections Used In Deluxe Chassis Only.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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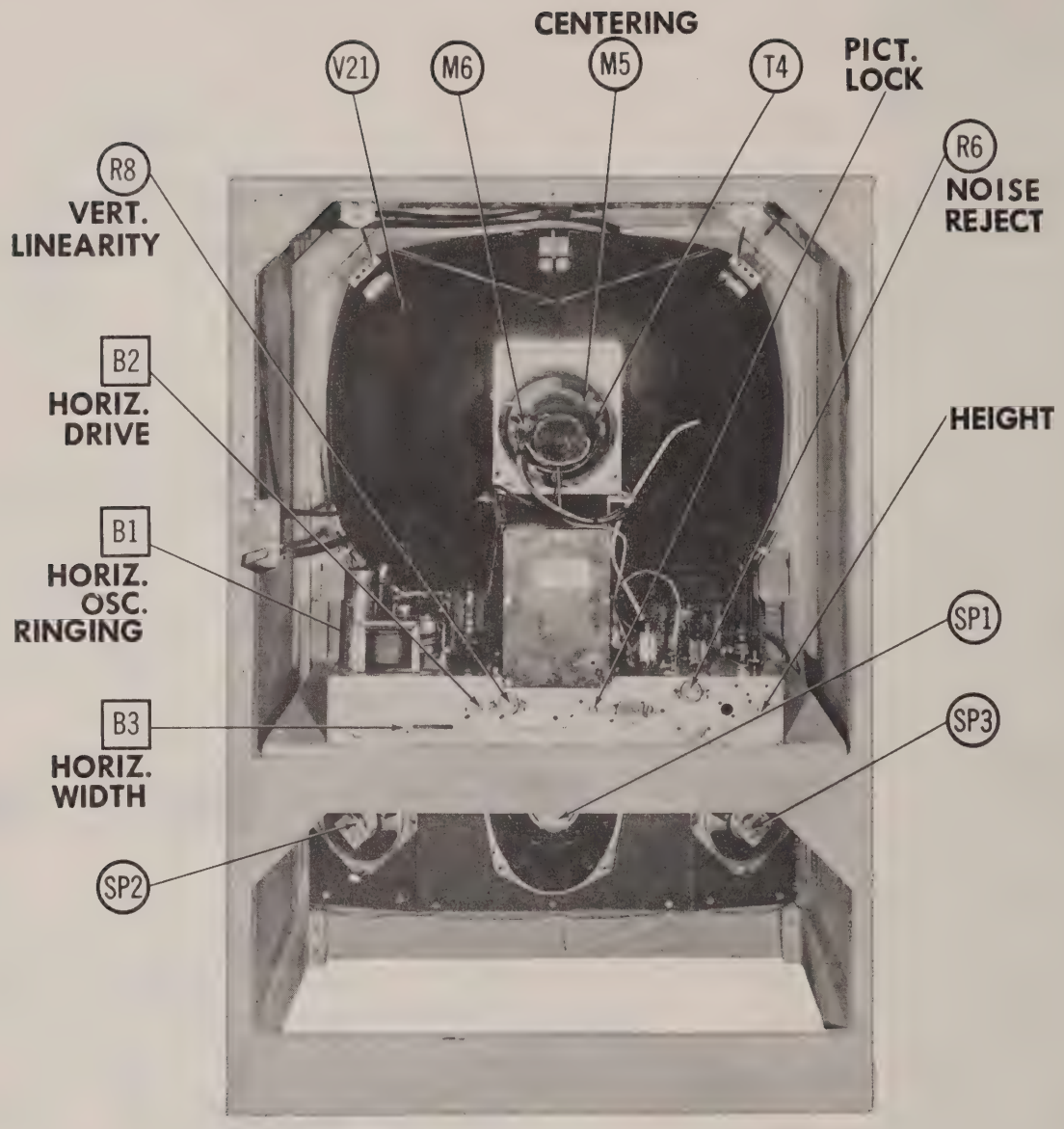
ALTERNATE AUDIO AMPLIFIER CIRCUIT SCHEMATIC



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably with a test pattern.

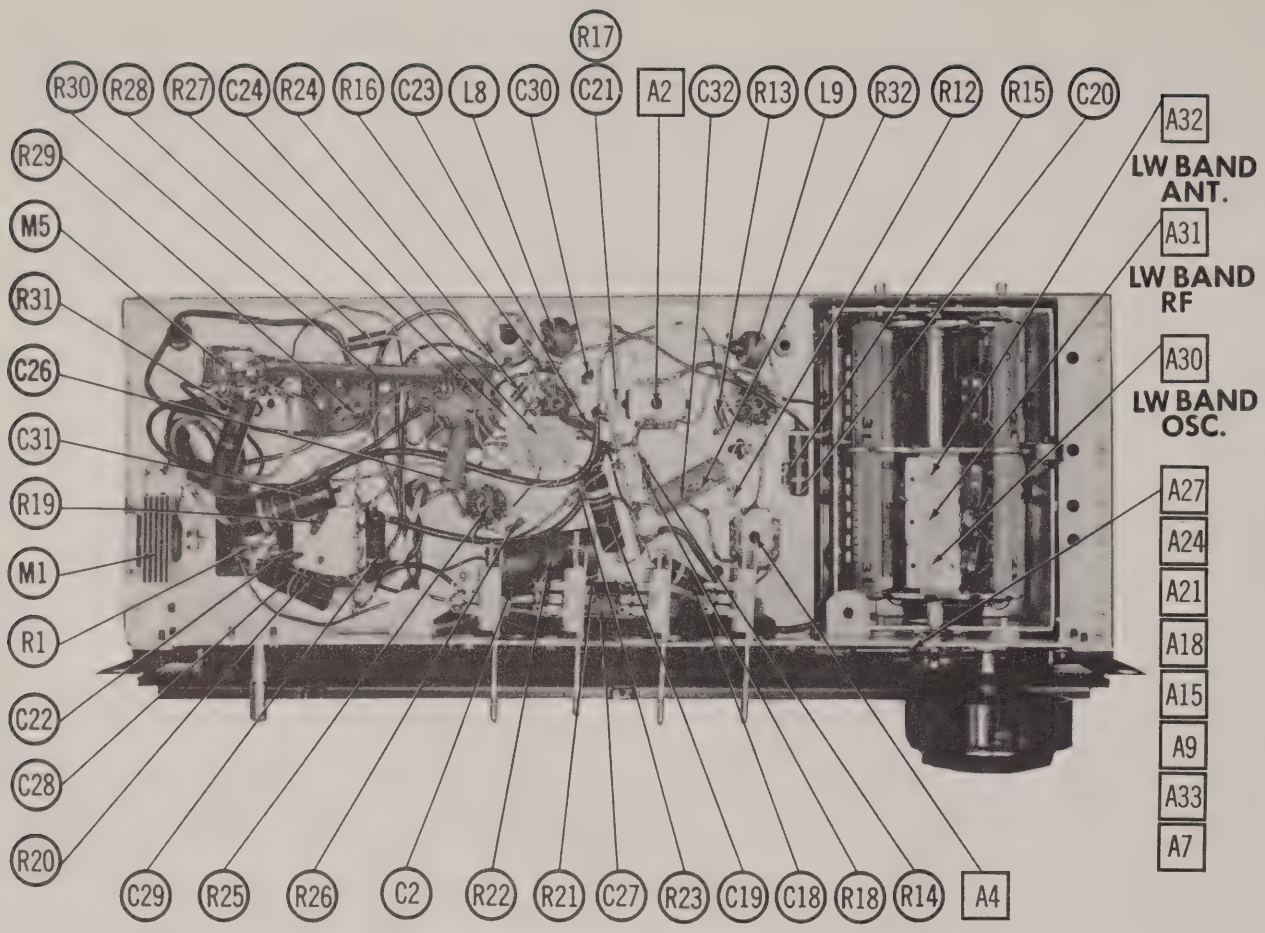
1. Connect a .1MFD 600 volt capacitor from point ⓓ to chassis.

2. Adjust the horizontal hold control until the picture synchronizes horizontally. Set the horizontal hold control so that approximately 1/4" appears between the right edge of the picture and the right edge of the raster. Turn the contrast control counter clockwise and move the picture off center to obtain this condition.

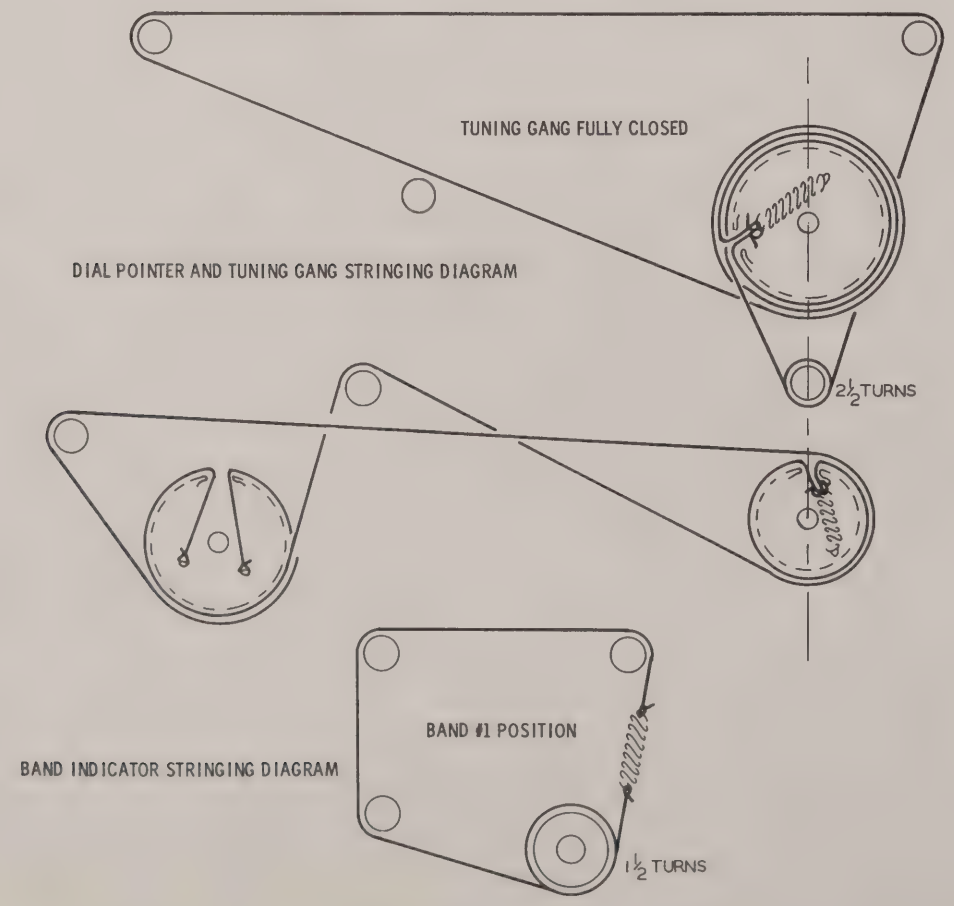
3. Remove the capacitor and adjust the horizontal oscillator ringing coil (B1) to again provide approximately 1/4" between the right edge of the raster and the right edge of the picture.

4. Switch off channel and back again. Picture should remain in sync. If necessary, repeat steps 1 thru 4 until proper horizontal sync is obtained. Recenter picture to normal position.

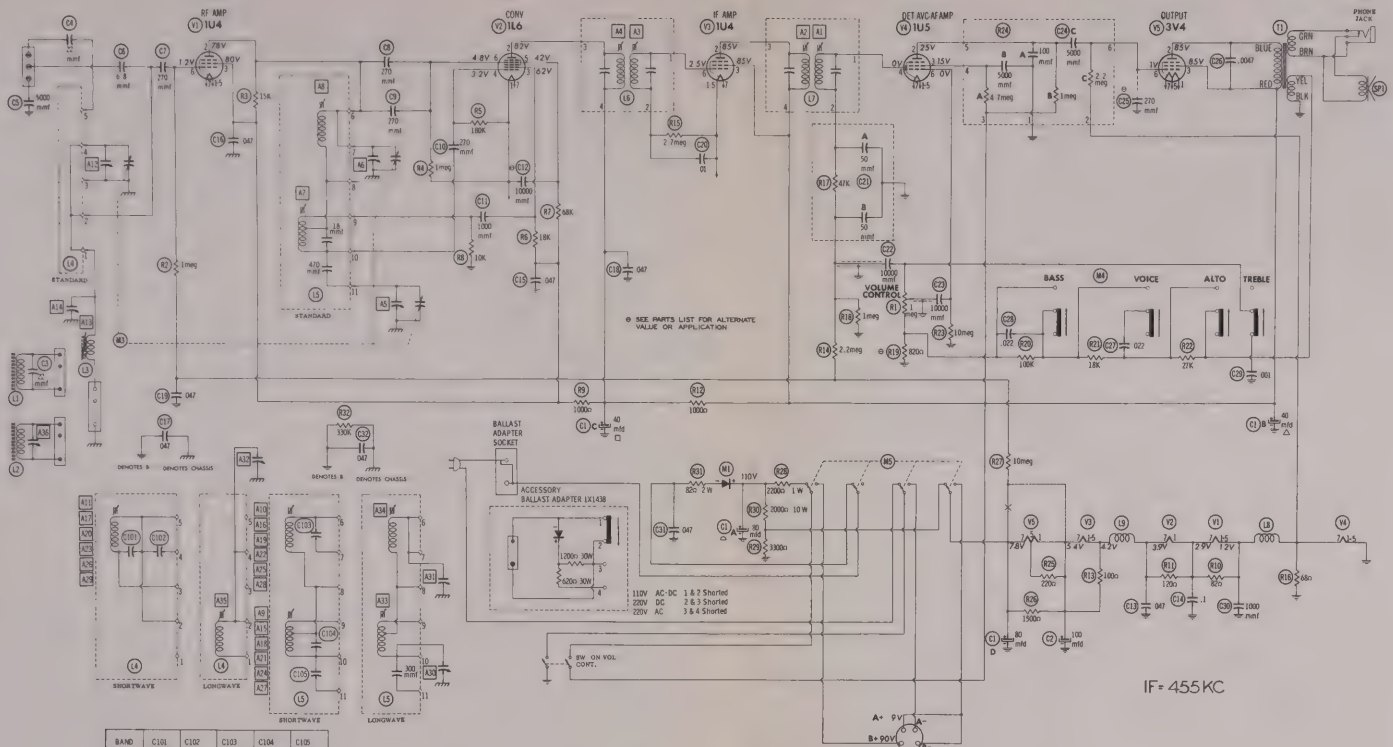
Adjust the horizontal drive trimmer (B2) counter clockwise as far as possible without the presence of white vertical lines or compression near the center of the picture. Adjust the horizontal width slug (B3) for a picture slightly wider than necessary to fill the picture mask horizontally.



CHASSIS—BOTTOM VIEW



DIAL CORD STRINGING



BAND	C101	C102	C103	C104	C105
1	None	550mmf	560mmf	6.8mmf	360mmf
2	None	13mmf	17mmf	None	12mmf
3	None	10mmf	14mmf	None	12mmf
4	None	22mmf	24mmf	None	18mmf
5	4.25mmf	330mmf	340mmf	5mmf	380mmf
6	None	15mmf	18mmf	None	13mmf

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	1U4	*	↑ 20K	↑ 4200Ω	TP	*	2.3Meg	*
V2	1L6	*	↑ 3200Ω	↑ 22K	180K	↑ 72K	1Meg	*
V3	1U4	*	↑ 2200Ω	↑ 2200Ω	TP	*	2.7Meg	*
V4	1U5	*	↑ 1Meg	↑ 4.7Meg	1Meg	*	10Meg	*
V5	3V4	*	↑ 2400Ω	↑ 2200Ω	NC	*	2.2Meg	*

* DO NOT USE OHMMETER TO MEASURE FILAMENT RESISTANCE.
ALL MEASUREMENTS TAKEN IN AC POSITION.
ALL MEASUREMENTS TAKEN IN DC POSITION
↑ MEASURED FROM OUTPUT OF M1
NC NO CONNECTION.
TP TIE POINT.

1. DC voltage measurements taken with vacuum tube voltmeter. AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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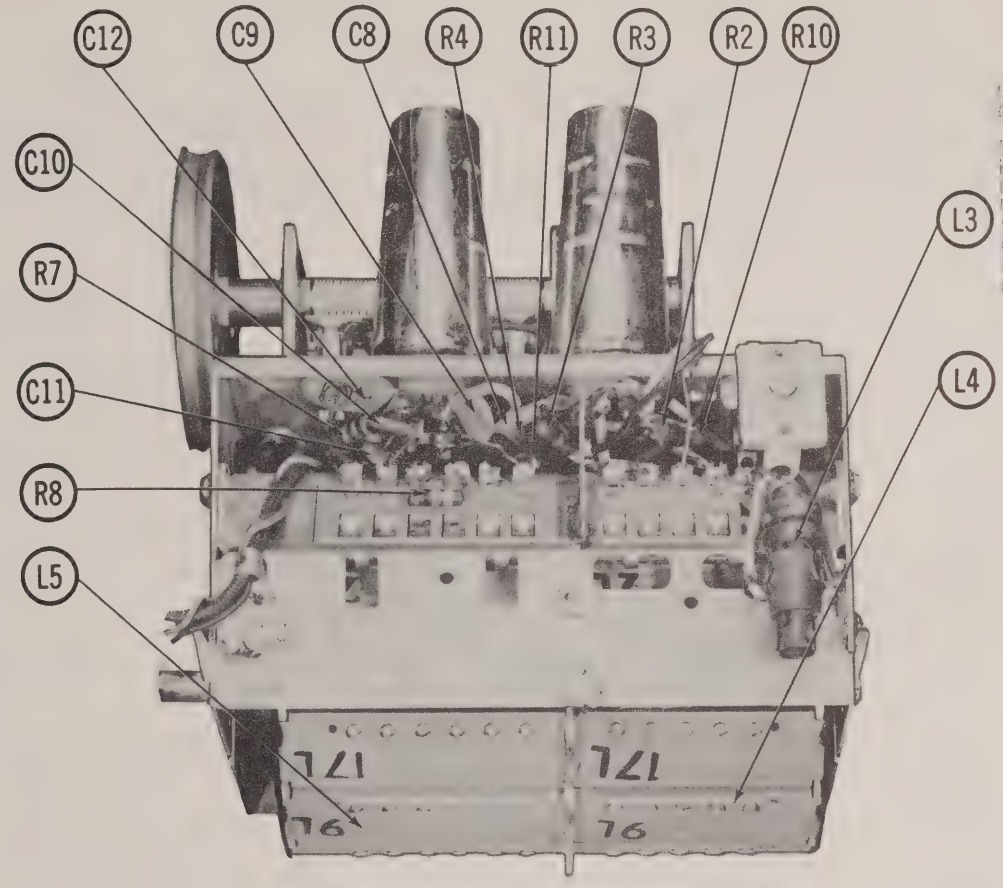
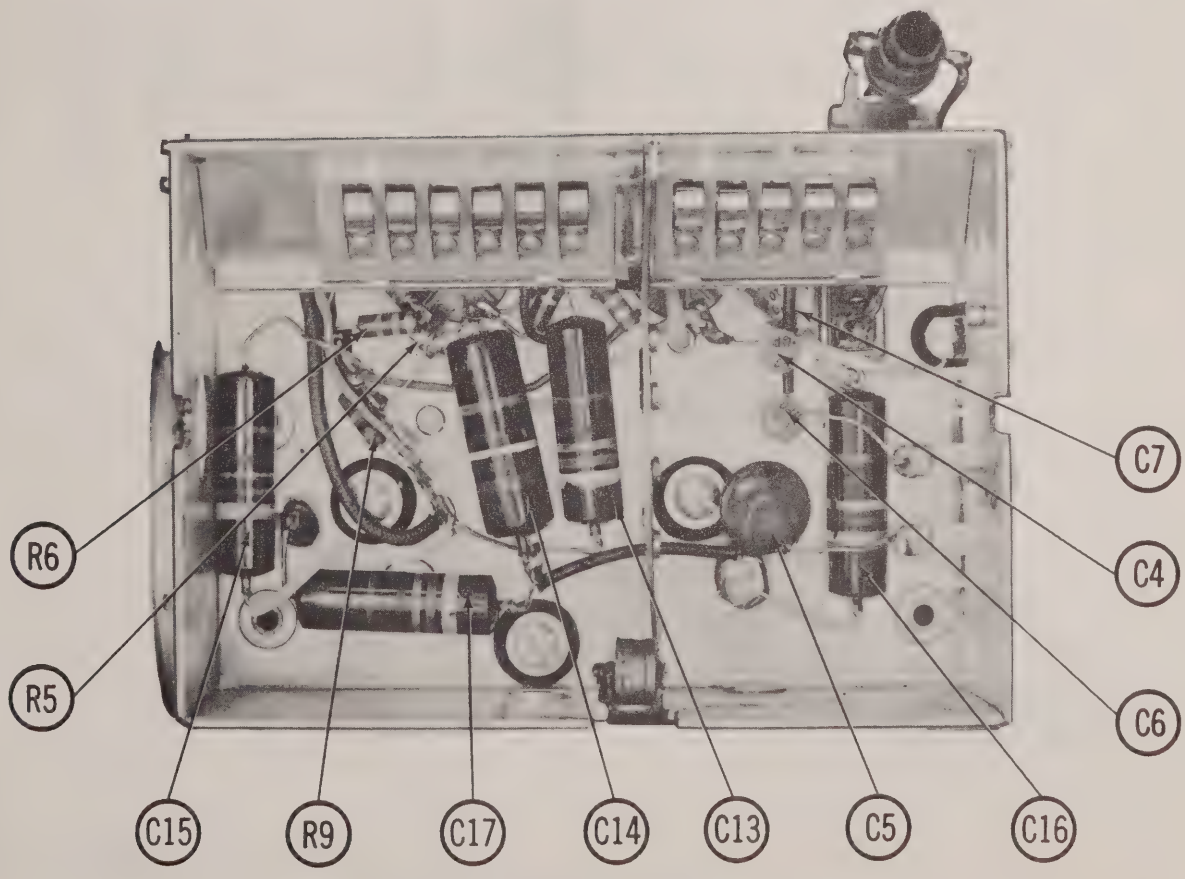


TUNER CHASSIS-SIDE VIEW



TUNER CHASSIS-BOTTOM VIEW

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Removal of button plug to the right of the band selector knob provides access to the oscillator slugs.
Remove antenna strips (except Band 7) for access to RF slugs (located at rear of osc. strips).
Antenna slugs are accessible thru hole in rear of tuner.
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Use battery power, if possible. If AC power is used, use an isolation transformer when available. If not, connect a .1MFD capacitor in series with low side of the signal generator and B-.

BC-SW-LW ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to BC RF stator plates. (Center section of gang.) Low side to chassis.	455KC (400~ Mod)	7	1000KC	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output. If AC power is used without an isolation transformer, reduce dummy antenna to 200MMF to reduce hum modulation.
2.	Direct	Loop	1500KC	"	1500KC	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.	"	"	1400KC	"	1400KC	"	A6	"
4.	"	"	600KC	"	600KC	"	A7, A8	"
5.	Fig. 1	High side thru dummy to whip antenna socket. Low side to chassis.	2.0MC	1	2.0MC	"	A9, A10, A11	Adjust for maximum output.
6.	"	"	3.5MC	"	3.5MC	"	A12	"
7.	Direct	Loop	600KC	7	600KC	"	A13	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
8.	"	"	1400KC	"	1400KC	"	A14	"
9.	Fig. 2	High side thru dummy to whip antenna socket. Low side to chassis.	15.0MC	2	15.0MC	"	A15	Adjust for maximum output.
10.	"	"	14.8MC	"	14.8MC	"	A16, A17	"
11.	"	"	18.0MC	3	18.0MC	"	A18	"
12.	"	"	17.55MC	"	17.55MC	"	A19, A20	"
13.	"	"	10.0MC	4	10.0MC	"	A21	"
14.	"	"	9.5MC	"	9.5MC	"	A22, A23	
15.	Fig. 1	"	4.0MC	5	4.0MC	"	A24	"
16.	"	"	5.2MC	"	5.2MC	"	A25, A26	"
17.	Fig. 2	"	12.0MC	6	12.0MC	"	A27	"
18.	"	"	11.6MC	"	11.6MC	"	A28, A29	"
19.	Direct	Loop	400KC	LW	400KC	"	A30	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
20.	"	"	360KC	"	360KC	"	A31, A32	"
21.	"	"	200KC	"	200KC	"	A33, A34 A35	"
22.		Replace stick-loop with external loop antenna. Radiate signal into this antenna.	1400KC	7	1400KC	"	A36	Adjust for maximum output.

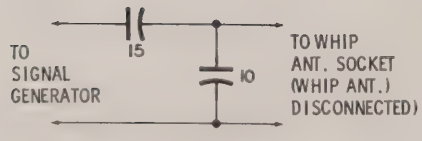


FIG. 1

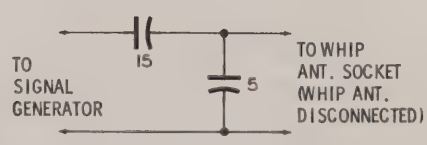


FIG. 2

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amplifier	1U4	
V2	Converter	1L6	
V3	IF Amplifier	1U4	

ITEM No.	USE	TYPE	NOTES
V4	Det-AVC-AF Amp.	1U5	
V5	Output	3V4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	CAPEHART PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▬80	150	451689A-1	AFH4-38	D033	FP411	TMQ-37	Q-125	R1360*
B	▲40	150							
C	■40	150							
D	80	25							
C2	100	25	451688A-1	PRS25V100	BRH251	TC2501	TD-100-25	MTH-2510	TVA-1207

* Non catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

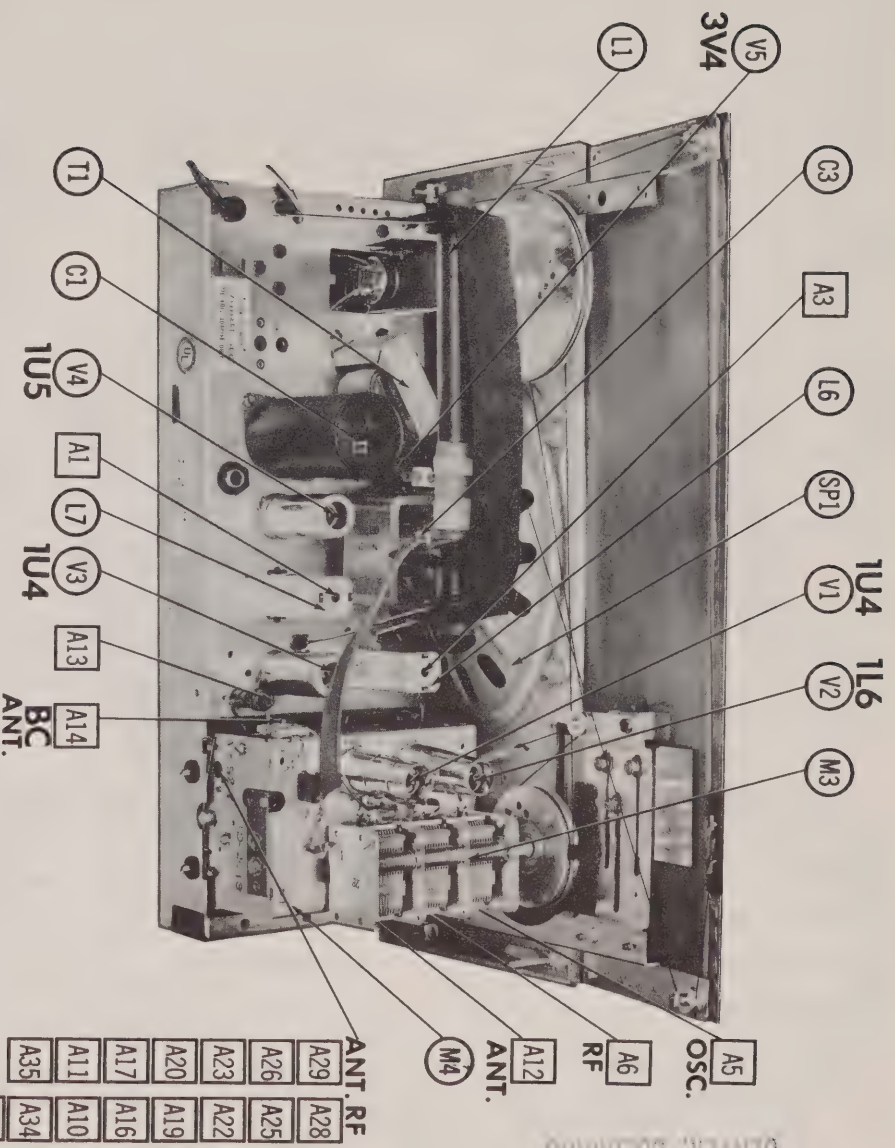
ITEM No.	RATING CAP.	RATING VOLT	CAPEHART PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C3	22			NP0-DI22	TCZ-22	Z024	NP0K-220		5TCC-Q22	
C4	22			NP0-DI22	TCZ-22	Z024	NP0K-220		5TCC-Q22	
C5	5000			BPD-005	DD-502	K080	811-005	DC525	5HK-D5	
C6	6.8			NP0-DI6.8	TCZ-6R8	Z013	NP0A-6R8	ZT-5568	5TCCB-V68	
C7	270			DI-00027	DD-271	TZ40	811-271		10GA-T27	
C8	270			DI-00027	DD-271	TZ40	811-271		10GA-T27	
C9	270			DI-00027	DD-271	TZ40	811-271		10GA-T27	
C10	270			DI-00027	DD-271	TZ40	811-271		10GA-T27	
C11	1000			BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C12	10000		600881-8	BPD-01	DD-103	K082	811-01	DC511	5HK-S1	Note 1
C13	.047	200	2248-4730	BPD-05	DF-503	CUB2S47			2TM-S47	
C14	.1	200		P288N-1	DF-104	CUB2P1			2TM-P1	
C15	.047	200	2248-4730	BPD-05	DF-503	CUB2S47			2TM-S47	
C16	.047	200	2248-4730	BPD-05	DF-503	CUB2S47			2TM-S47	
C17	.047	200	2248-4730	BPD-05	DF-503	CUB2S47			2TM-S47	
C18	.047	200	2248-4730	BPD-05	DF-503	CUB2S47			2TM-S47	
C19	.047	200	2248-4730	BPD-05	DF-503	CUB2S47			2TM-S47	
C20	.01	400	2247-1030	BPD-01	D6-103	CUB4S1	GP3-333-103		4TM-S1	
C21A	50		†451700A-1	†PA-97-1	†PC-50	†111TM1	†1403-01		†D-1	
B	50									
C22	10000		600881-8	BPD-01	DD-103	K082	811-01		5HK-S1	
C23	10000		600881-8	BPD-01	DD-103	K082	811-01		5HK-S1	
C24A	100									
B	5000		♦451701A-1	♦PA-117-3	♦PC-91	♦114TM2	♦1407-03		♦P-2	
C	5000									
C25	270		2272-21271	DI-00027	DD-270	TP41	811-271	UC-5327	5GA-T27	Note 2
C26	.0047	600	2248-4720	BPD-0047	D6-472	CUB6D47	GP2-333-472		6TM-D47	
C27	.022	200	2246-2230	BPD-02	DF-203	CUB4S22	817-02		2TM-S22	
C28	.022	200	2246-2230	BPD-02	DF-203	CUB4S22	817-02		2TM-S22	
C29	.001	600	2248-1020	BPD-001	D6-102	CUB6D1	GP2L-102		6TM-D1	
C30	1000		450469A-5	BPD-001	DD-102	K069	801-001		5HK-D1	
C31	.047	600	2248-4730	BPD-05	DF-503	CUB6S47			6TM-S47	
C32	.047	600	2248-4730	BPD-05	DF-503	CUB4S47			4TM-S47	

† Items C21A, C21B and R17 are combined in one unit.
♦ Items C24A, C24B, C24C, R24A, R24B and R24C are combined in one unit.
Note 1: Some versions may use .02MFD units in this application.
Note 2: Not used in some versions.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	CAPEHART PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½	451703A-1	B-70-S	A47-1Meg-Z		U53	Volume
B	Shaft		Not Req.	Not Req.	FS-3		Not Req.	Attach to R1A
C	Switch		Not Req.	Not Req.	SWE-20		US-27	Attach to R1A
D	Washer							

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	CAPEHART PART No.	IRC PART No.	
R2	1Meg			BTS-1Meg	
R3	15K			BTS-15K	
R4	1Meg			BTS-1Meg	
R5	180K			BTS-180K	
R6	18K			BTS-18K	
R7	68K			BTS-68K	
R8	10K			BTS-10K	
R9	1000Ω			BTS-1000	
R10	82Ω			BTS-82	
R11	120Ω			BTS-120	
R12	1000Ω		3229-102	BTS-1000	
R13	100Ω 5%		3228-101	BTS-100 5%	
R14	2.2Meg		3229-225	BTS-2.2Meg	
R15	2.7Meg		3229-275	BTS-2.7Meg	
R16	68Ω 5%		3228-680	BTS-68 5%	
R17	47K		†451700A-1	BTS-47K	
R18	1Meg		3229-105	BTS-1Meg	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	CAPEHART PART No.	IRC PART No.	
R19	820Ω			BTS-820	Note 1
R20	100K		3229-104	BTS-100K	
R21	18K		3229-183	BTS-18K	
R22	27K		3229-273	BTS-27K	
R23	10Meg		3229-106	BTS-10Meg	
R24A	4.7Meg		♦451701A-1	BTS-4.7Meg	
B	1Meg			BTS-1Meg	
C	2.2Meg			BTS-2.2Meg	
R25	220Ω 5%		3228-221	BTS-220 5%	
R26	1500Ω 5%		3228-152	BTS-1500 5%	
R27	10Meg		3229-106	BTS-10Meg	
R28	2200Ω	1	3232-222	BTA-2200	
R29	3300Ω 5%		3228-332	BTS-3300 5%	
R30	2000Ω 5%	10	451690A-1	1 3/4A-2000 5%	
R31	82Ω 5%	2	451691A-1		
R32	330K		3229-334	BTS-330K	

† Items R17, C21A, C21B are combined in one unit.
♦ Items R24A, R24B, R24C, C24A, C24B and C24C are combined in one unit.
Note 1: Some versions use 1500Ω in this application. (part #3229-152)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	CAPEHART PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	8.5K	3-4Ω SEC. 2 18.6Ω	451697A-1						

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	CAPEHART PART No.	QUAM PART No.	RCA TYPE No.	
SP1	5" X 7"	PM	3-4Ω	451702A-1	57A15	257S1	

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	CAPEHART PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Loop Stick	.3Ω		451692A-1				
L2	Loop Stick	.4Ω		451693A-1				International; Includes 3-30MMF Trimmer
L3	Ant. Loading Coil	2.4Ω		451694A-1				
L4A	Ant. Coil	2.5Ω		451719A-1				Band 1, Includes Cap.
B	Ant. Coil	.1Ω		451723A-1				Band 2, Includes Cap.
C	Ant. Coil	.1Ω		451724A-1				Band 3, Includes Cap.
D	Ant. Coil	.5Ω		451721A-1				Band 4, Includes Cap.
E	Ant. Coil	.8Ω		451720A-1				Band 5, Includes Cap.
F	Ant. Coil	.5Ω		451722A-1				Band 6, Includes Cap.
G	Ant. Coil	0Ω		451718A-1				Band 7
H	Ant. Coil	16.5Ω		451725A-1				Band 8
L5A	RF & Osc. Coils	2.6ΩRF 2.3ΩOsc.	Tap ⓐ 1.8Ω	451726A-1				Band 1, Includes Cap.
B	RF & Osc. Coils	.1ΩRF 1.4ΩOsc.	Tap ⓐ .6Ω	451730A-1				Band 2, Includes Cap.
C	RF & Osc. Coils	.1ΩRF .5ΩOsc	Tap ⓐ .4Ω	451731A-1				Band 3, Includes Cap.

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	CAPEHART PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
D	RF & Osc. Coils	.5ΩRF 1.8ΩOsc	Tap ⓐ .6Ω	451728A-1				Band 4, Includes Cap.
E	RF & Osc. Coils	.8ΩRF 1.7ΩOsc	Tap ⓐ .8Ω	451727A-1				Band 5, Includes Cap.
F	RF & Osc. Coils	.5ΩRF 1.6ΩOsc.	Tap ⓐ .7Ω	451729A-1				Band 6, Includes Cap.
G	RF & Osc. Coils	6ΩRF 8.5ΩOsc	Tap ⓐ 2.5Ω	451733A-1				Band 7, Includes Cap.
H	RF & Osc. Coils	17ΩRF 16ΩOsc	Tap ⓐ 3.4Ω	451732A-1				Band 8, Includes Cap.
L6	Input IF	16Ω	16Ω	451696A-1	16-6758	BC-352	12-C1	
L7	Output IF	16Ω	16Ω	451696A-1	16-6758	BC-352	12-C2	
L8	Fil. Choke	5.3Ω		451695A-1				246 Microhenries
L9	Fil. Choke	5.3Ω		451695A-1				246 Microhenries

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA						NOTES
	CURRENT	CAPEHART PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	
M1	.066A	451704A-1	1004A	RS100A	6S100	5M1	100	

BATTERIES

ITEM No.	VOLTAGE	CAPEHART PART No.	REPLACEMENT DATA						INSTALLATION NOTES
			EVEREADY			BURGESS			
			"A"	"B"	"A-B"	"A"	"B"	"A-B"	
M2	9V "A" 90V "B"	P999			752			G6B60	

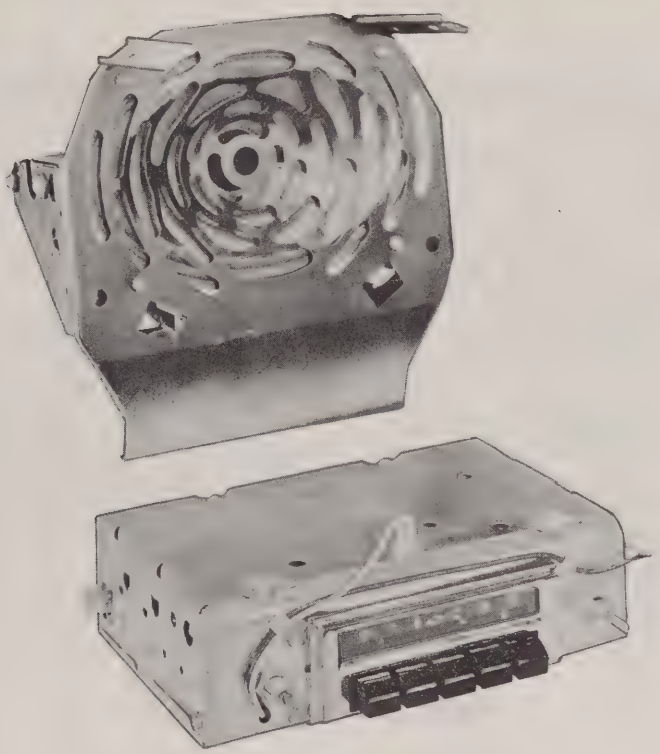
MISCELLANEOUS

ITEM No.	PART NAME	CAPEHART PART No.	NOTES
M3	Tuning Cap.	451711A-1	3 Gang (20-492MMF, 20-492MMF, 20-492MMF)
M4A	Switch	451698A-1	Tone (Bass) SPDT, Slide Type
B	Switch		Tone (Voice) SPDT, Slide Type
C	Switch		Tone (Alto) SPDT, Slide Type
D	Switch		Tone (Treble) SPDT, Slide Type
M5	Switch	451699A-1	Power Changeover (4 Pole - 2 Position; Rotary, Wafer type)
A14	Trimmer Cap.	13F-225	Ant. (2-20MMF) Long Wave Band and Band 7
	Handle	451687A-1	
	Knob	451712A-1	Push Button (4 used)
	Knob	451713A-1	On-Off-Volume
	Knob	451714A-1	Tuning
	Knob	451715A-1	Band Selector

CHEVROLET
MODEL 987368

DENVER, COLORADO

CHEVROLET
MODEL 987368



TRADE NAME	Chevrolet Model 987368 (For 1956 Chevrolet Automobiles)
MANUFACTURER	Delco Radio Div., General Motors Corp., Kokomo, Ind.
TYPE SET	Battery Operated Custom Built AM Superheterodyne Automobile Receiver
TUBES (Seven)	Types 12BA6 RF Amplifier, 12BE6 Converter, 12AU6 IF Amplifier, 12BF6 Det-AVC-AF Amp., (2) 12V6GT Output, 0Z4 Rectifier.
POWER SUPPLY	12 Volt Storage Battery
TUNING RANGE—BROADCAST	540KC - 1600KC
RATING	3.5 Amp. @ 12.6 Volts DC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01MFD	High side to pin 7 (grid) of 12BE6 (V2). Low side to chassis.	262KC (400∿ mod)	High frequency end of dial.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output.
2.	82MMF	Thru dummy to ant. receptacle.	1615KC	"	"	A5, A6, A7	Preset A8 (Osc. core) so that the rear of core is 1 27/32" from mounting end of coil form. Adjust A5, A6 and A7 in order given for maximum output.
3.	"	"	1000KC	Tune to 1000KC signal.	"	A9, A10	Adjust for maximum output.
4.	"	"	1615KC	High frequency end of dial.	"	A6, A7	"
5.	"	"	900KC	Tune to 900KC signal.	"		Adjust pointer adjustment screw so pointer coincides with 900KC on dial.
6.	With radio installed in car and antenna fully extended, tune in a weak station between 600KC and 1000KC and adjust A7 for maximum volume.						

PUSH BUTTON ADJUSTMENT

Pull push button to the right and out. Tune manually to desired station, push push button in firmly. Repeat on remaining push buttons.

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PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amplifier	12BA6	
V2	Converter	12BE6	
V3	IF Amplifier	12AU6	
V4	Det-AVC-AF Amp.	12BF6	
V5	Output	12V6GT	
V6	Output	12V6GT	
V7	Rectifier	0Z4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	DELCO PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■20	400	6322	AFH3-120	C099	FP345. 8	TM-3036	T-550	TVL-3678
B	▲20	400							
C	20	25							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	DELCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	.05	200	6512	BPD-05	DF-503	CUB2S5		PT415	2TM-S5	
C3	.05	400	6512	BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C4	15		6361	NP0-DI15	TCZ-15	Z021	NP0K-150		5TCC-Q15	
C5	39		5366							
C6	180		7257424							
C7	10	500	G-100	NP0-DI10	TCZ-10	22R5Q1	831-100	MCB215	MS-41	
C8	220	500	G-221	NP0-SI220	D6-221	22R5T22	811-221		MS-322	
C9	2000		6352	BPD-002	DD-202	K072	801-002	DC522	5HK-D2	
C10	.01	400	6510	BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C11	.003	400	6529	DI-003	D6-302	CUB6D3	GP2-333-302	PT623	6TM-D3	
C12	.1	400	6513	P488N-1	DF-104	CUB4P1		PT401	4TM-P1	
C13	100		G-101	N750-SI100	TCN-101	TN22	N750L-101	NT-531	5TCU-T1	
C14	.003	1000	H-302	HVD-15-3300	DD30-302	CUB16D3	1R5KV-332	PT1623	10TM-D3	
C15	.007	1600	H-702	P1688N-007	DD16-702	CUB16D7		PT1627	16TM-D7	
C16	.47	100	7257906	VHC36		ST2P5		RF480	68P20	
C17	.47	100	7257906	VHC36		ST2P5		RF480	68P20	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	DELCO PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	2Meg	½	7266842	F1-68		*QJ-1019A	UF26A	Tone (Panel)
B	300K			R2-38			UR354-T74†	Volume (Rear) Tapped at 50K
C	Bushing			AK-27			EB-214	Attach to R1A
D	Switch			KB-7			US-27	Attach to R1B

* Concentrikit Equivalent: K-8 Kit, Base Elements & Shafts; B13-139 & P14-102 (Panel)
B18-132X & R1-113 (Rear)
76-2 Switch
S12 Bushing

† Universal Replacement (Mallory exact duplicate part no. UE1741S)

RESISTORS

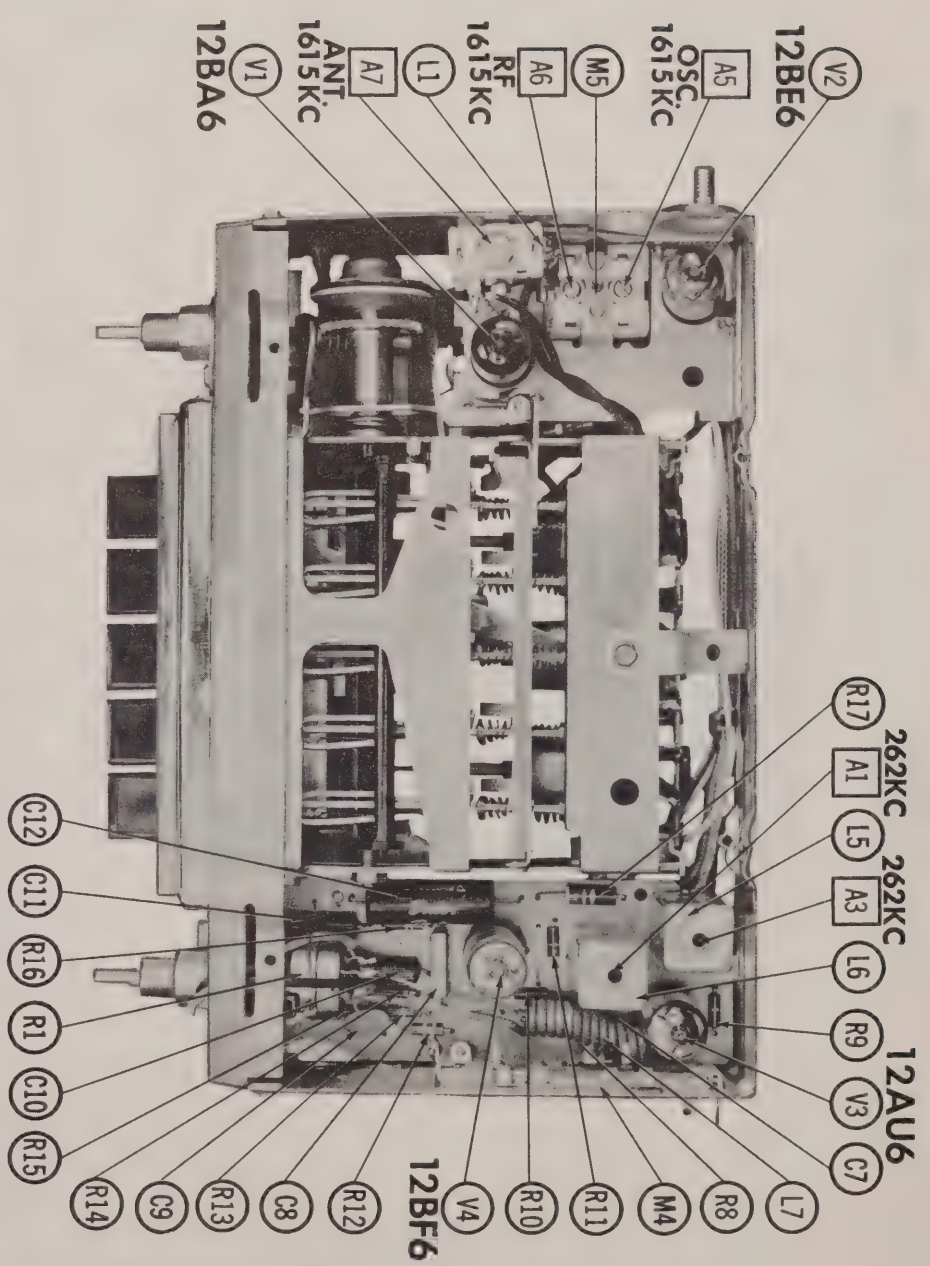
All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	DELCO PART No.	IRC PART No.	
R2	2.2Meg		1239	BTS-2.2Meg	
R3	15K	1	1253	BTA-15K	
R4	68Ω		1111	BTS-68	
R5	330K		1229	BTS-330K	
R6	22K		1215	BTS-22K	
R7	15K	2	1277	BTB-15K	
R8	1Meg		1235	BTS-1Meg	
R9	270Ω		1118	BTS-270	
R10	1Meg		1235	BTS-1Meg	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	DELCO PART No.	IRC PART No.	
R11	47K		1219	BTS-47K	
R12	2200Ω		1129	BTS-2200	
R13	1000Ω		1125	BTS-1000	
R14	1Meg		1235	BTS-1Meg	
R15	820K		1234	BTS-820K	
R16	82K		1222	BTS-82K	
R17	47K	1	1259	BTA-47K	
R18	360Ω 5%	2	7234563	BTB-360 5%	
R19	1800Ω	2		BW2-1800	Note 1
R20	15K	1	1253	BTA-15K	

Note 1: Mfgr. states to replace with 2700Ω 2W (part #1204) and 5600Ω 1W (part #1171) wired in parallel.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (VIBRATOR)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	DELCO PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	12VCT @1.8A	550VCT @.062A			6067	V3902	P-2861	P-6489	22R52	

TRANSFORMER (INPUT)

ITEM No.	RESISTANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	DELCO PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	1.8K CT		6061						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	DELCO PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T3	7.9K	3-4Ω	6063	Z1007 ①	A-2936①	A-3852 ①	22S56 ①	S-15X ①	① Fab. Mounting.

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	DELCO PART No.	QUAM PART No.	RCA TYPE No.	
SP1	6" X 9"	PM	3-4Ω	6112	69A3	238S1	

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	DELCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Coupling Coil	.6Ω		7255738	19-1005		4612	9 Microhenries
L2	Ant. Coil	9.5Ω		7258914				
L3	RF Coil	9.5Ω		7258914				
L4	Osc. Coil	1Ω	4.2Ω	7258911				
L5	Input IF	32Ω	32Ω	1220888				
L6	Output IF	32Ω	32Ω	1220889				
L7	Fil. Choke	0Ω		1217846	19-4215	BC-537	5221	
L8	Vib. Hash Choke	.1Ω		7265389				

VIBRATOR

ITEM No.	TYPE	INPUT VOLTS	FREQUENCY	REPLACEMENT DATA				NOTES
				DELCO PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	RADIART PART No.	
M1	Interrupter	12V	115∿	8550	6330	G883	6330	

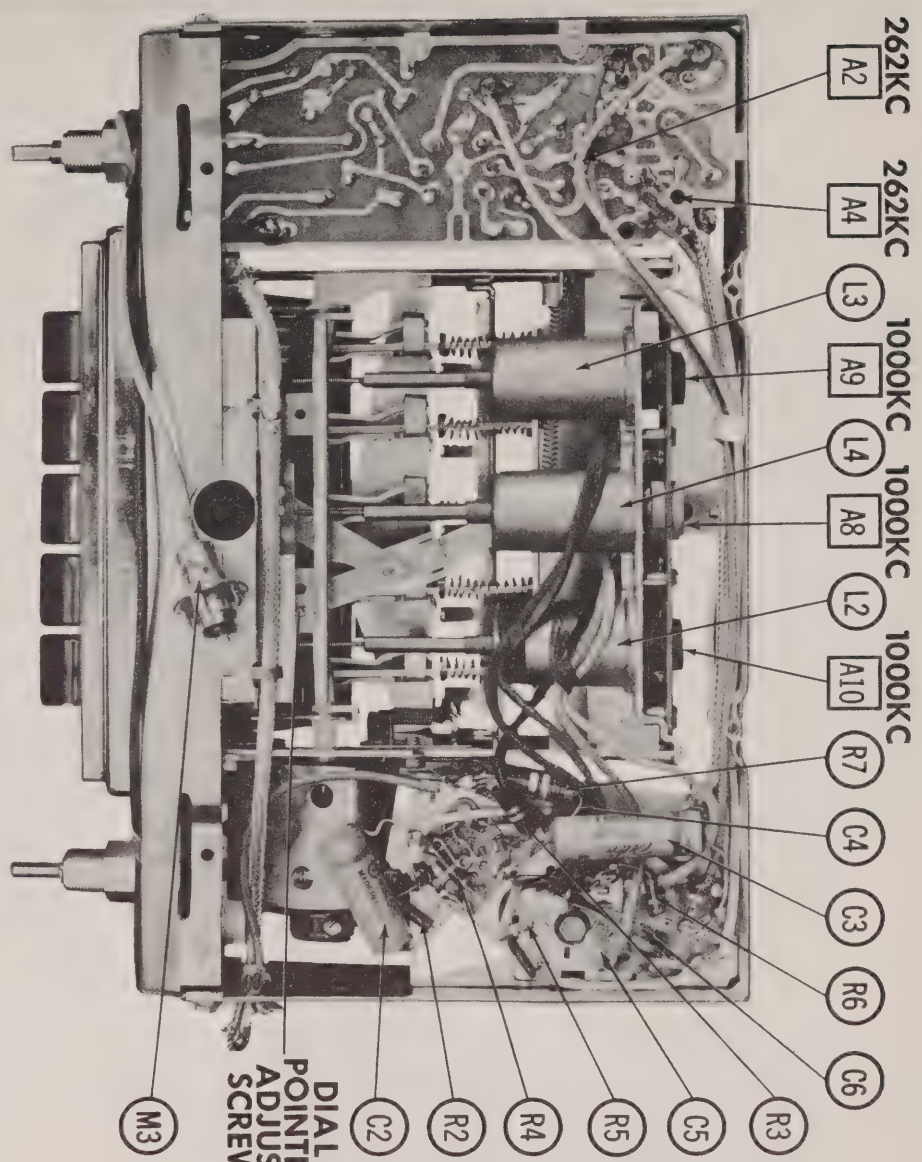
FUSES

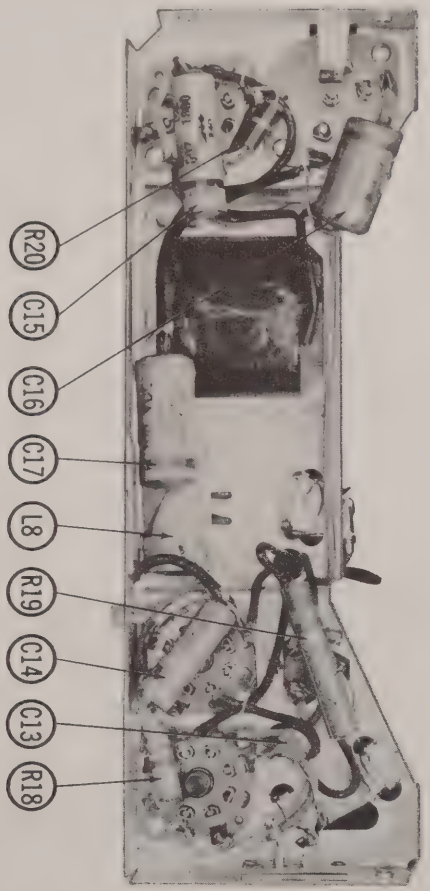
ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			DELCO PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2		7½A	455640		30307.5 (7AG 7½A)		SFE 7½	

MISCELLANEOUS

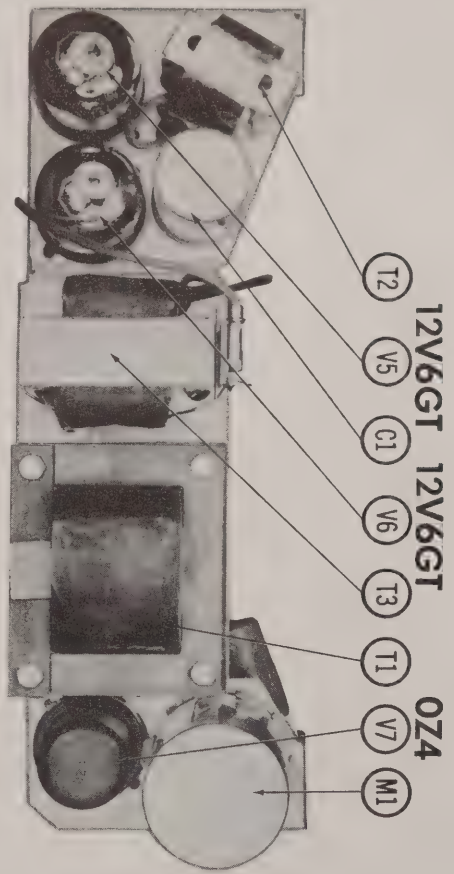
ITEM No.	PART NAME	DELCO PART No.	NOTES
M3	Dial Light		#57
M4A	Spark Plate	1220885	Power Input Lead
B	Spark Plate		Dial Light Lead
M5	Trimmer Cap.	7242454	Dual: Osc. (A5), RF (A6)
A7	Trimmer Cap.	7265255	Ant.
	Knob	1990825	On-Off-Volume & Tuning
	Knob	7265132	Tone
	Knob	7265149	Dummy
	Pushbutton & Slide Assembly	1220667	5 Used

CHASSIS—BOTTOM VIEW

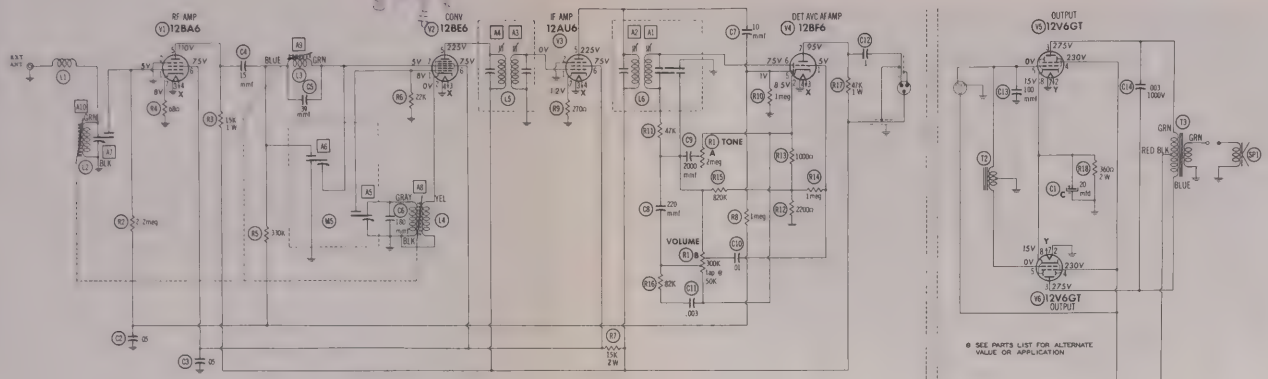




POWER SUPPLY CHASSIS-BOTTOM VIEW



POWER SUPPLY CHASSIS-TOP VIEW



IF=262KC

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V1	12BA6	6.2Meg	0Ω	0Ω	1Ω	†17K	†17K	68Ω	
V2	12BE6	22K	1Ω	1Ω	0Ω	†1800Ω	†17K	2.3Meg	
V3	12AU6	32Ω	0Ω	0Ω	1Ω	†1800Ω	†17K	270Ω	
V4	12BF6	1Meg	3200Ω	1Ω	0Ω	1Meg	250K	†50K	
V5	12V6GT	NC	1Ω	†220Ω	†1800Ω	1000Ω	NC	0Ω	360Ω
V6	12V6GT	NC	0Ω	†190Ω	†1800Ω	1200Ω	NC	1Ω	360Ω
V7	OZ4	0Ω	NC	240Ω	NC	265Ω	NC	TP	18K

† MEASURED FROM PIN 8 OF V7
NC NO CONNECTION
TP TIE POINT

1. D.C. voltage measurements taken with vacuum tube voltmeter; A.C. voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Battery voltage maintained at 13.5 volts for voltage readings.
5. Nominal tolerance on components values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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COLUMBIA RECORDS MODEL 424

COLUMBIA RECORDS MODEL 424

COLUMBIA RECORDS MODEL 424

TRADE NAME	Columbia Records Model 424
MANUFACTURER	Columbia Records, 799 Seventh Ave., New York 19, N. Y.
TYPE SET	AC Operated Phono Amplifier With 3 Speed Automatic Record Changer
TUBES (FOUR)	Types 6C4 AF Amp., 12AX7 AF Amp-Phase Inv., (2) 50L6GT Output
POWER SUPPLY	105-125 Volts AC - 60~ RATING .38 Amp. @ 117 Volts AC

FOR SERVICE INFORMATION ON RECORD CHANGER - SEE SIMILAR V-M MODEL 954B - PHOTOFACT SET #302 - FOLDER #12

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PARTS LIST AND DESCRIPTIONS

COLUMBIA RECORDS
MODEL 424

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amplifier	6C4	
V2	AF Amp. -Phase Inv.	12AX7	
V3	Output	50L6GT	
V4	Output	50L6GT	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Columbia Records PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	40	150		PRS150V40	BR4015	TC48	TD-40-150	FM-1540	TVA-1413
C2A	40	350							
B	40	350							
C	40	350	Note 1						
D	40	150							
C3	40	150		PRS150V40	BR4015	TC48	TD-40-150	FM-1540	TVA-1413

Note 1: Some versions use 30MFD in this application.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	Columbia Records PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C4	.068	200		P288N-068		CUB4S68			4TM-S68	Note 2
C5	68			SI68	D6-680	TP32	GP1K-680	UC-5468	5GA-Q68	Note 3
C6	.01	200		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	Note 3
C7	.05	200		BPD-05	DF-503	CUB2S5		PT415	2TM-S5	
C8	2000			BPD-002	DD-202	K072	801-002	DC-522	5HK-D2	
C9	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C10	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C11	330			DI330	D6-331	TP43	GP2K-331	UC-5333	5GA-T33	Note 4
C12	330			DI330	D6-331	TP43	GP2K-331	UC-5333	5GA-T33	Note 4
C13	.068	200		P288N-068		CUB4S68			4TM-S68	Note 2
C14	680			SI680	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C15	.05	400		BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C16	.05	200		BPD-05	DF-503	CUB2S5		PT415	2TM-S5	
C17	.05	400		BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C18	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C19	.0047	400		SI4700	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C20	.05	400		BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C21	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C22	.1	400		P488N-1	DF-104	CUB4P1		PT401	4TM-P1	Note 2

Note 2: Some versions use .05MFD in this application.
Note 3: Not used in some versions.
Note 4: Some versions use 400MMF in this application.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	Columbia Records PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	250K	½		ABT-53	A47F1-250K	Q13-130X		Treble, Tap at 125K
B	Shaft			AK-4	KSS-3	Not Req.		Attach to R1A
R2A	1Meg	½		ABT-165		Q18-137XX	UDT-289	Loudness, Tap at 350K & 650K
B	Shaft			AK-4		Not Req.	Not Req.	Attach to R2A
R3A	1Meg	½		AB-69	A47-1Meg-S	Q11-137	U-54	Bass
B	Shaft			AK-4	KSS-3	Not Req.	Not Req.	Attach to R3A

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	Columbia Records PART No.	IRC PART No.	
R4	1.5Meg			BTS-1.5Meg	
R5	680K			BTS-680K	
R6	68K			BTS-68K	
R7	8200Ω			BTS-8200	
R8	68K			BTS-68K	
R9	100K			BTS-100K	
R10	33K			BTS-33K	
R11	33K			BTS-33K	
R12	8.2Meg			BTS-8.2Meg	Note 1
R13	270K			BTS-270K	
R14	100Ω			BTS-100	
R15	8.2Meg			BTS-8.2Meg	Note 1
R16	270K			BTS-270K	
R17	22K			BTS-22K	
R18	270K			BTS-270K	
R19	270K			BTS-270K	
R20	100K			BTS-100K	
R21	33K			BTS-33K	
R22	100Ω	1		BTA-100	
R23	6.8Meg			BTS-6.8Meg	
R24	6.8Meg			BTS-6.8Meg	
R25	10K	1		BW-1-10K	
R26	10K			BTS-10K	
R27	680Ω			BTS-680	Note 2
R28	125Ω	5			
R29	50Ω	5			

Note 1: Some versions use 10Meg in this application.
Note 2: Some versions use 2200Ω in this application.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	Columbia Records PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	4.6K	1.65Ω SEC. 2 5.9Ω Res.	TR-123						

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	Columbia Records PART No.	QUAM PART No.	RCA TYPE No.	
SP1	6"	PM	3.3Ω		6A3ILF		
SP2	6"	PM	3.3Ω		6A3ILF		
SP3							Electrostatic Speaker
SP4							Electrostatic Speaker

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA						NOTES
	CURRENT	Columbia Records PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	
M1	.087A		1004	RS100	6S100	5M1	100	
M2	.087 A		1004	RS100	6S100	5M1	100	

PHONO CARTRIDGE

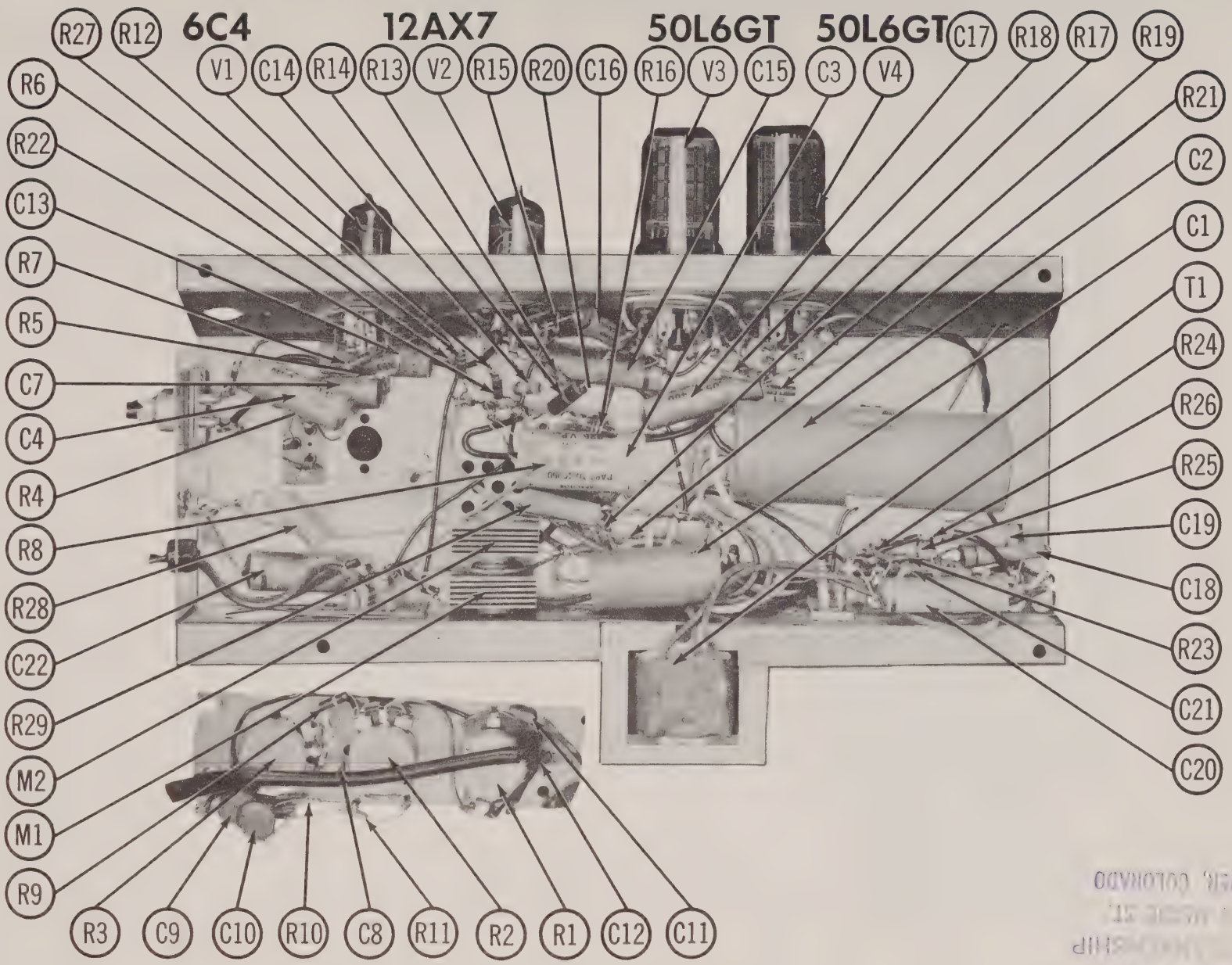
ITEM No.	REPLACEMENT DATA					REMARKS
	Columbia Records PART No.	ASTATIC PART No.		ELECTRO-VOICE PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M3		112-TS	A-1 and A-3	46-T	0-1 or S-1 and 0-3	

ASTATIC AND ELECTRO VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA				REMARKS
	Columbia Records PART No.	FIDELITONE PART No.	JENSEN PART No.	WALCO PART No.	
M4		†C-449 or ♦C-449D and †A-448 or ♦A-448D	†CR-55 or ♦CR-55D and †CR-55LP or ♦CR-55LPD	†W-64S and †W-64MGS	† Jewel ♦ Diamond

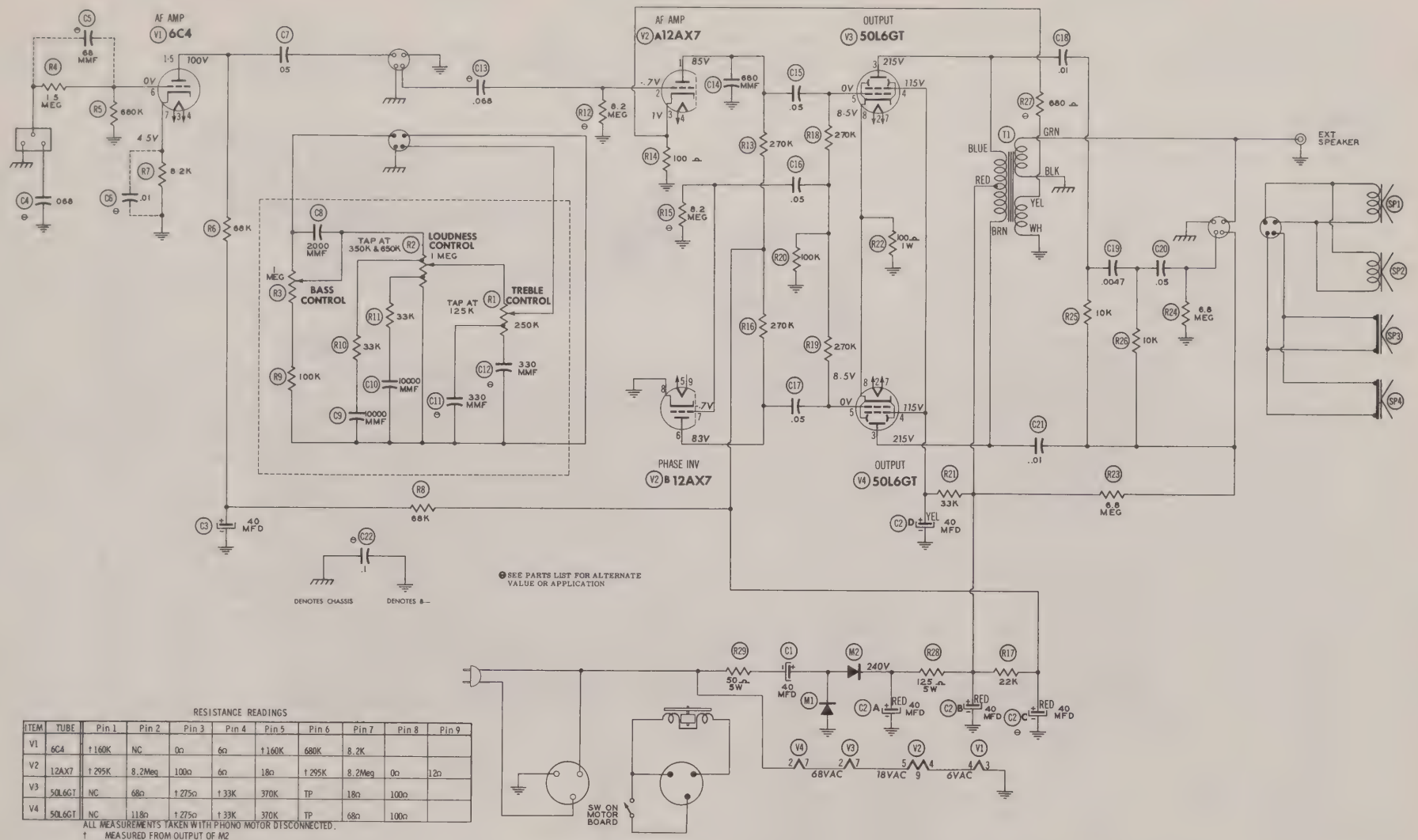


CHASSIS BOTTOM VIEW

DENVER, COLORADO

COLUMBIA RECORDS
MODEL 424

SET 331 FOLDER 5



⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6C4	†160K	NC	0Ω	6Ω	†160K	680K	8.2K		
V2	12AX7	†295K	8.2Meg	100Ω	6Ω	18Ω	†295K	8.2Meg	0Ω	12Ω
V3	50L6GT	NC	68Ω	†275Ω	†33K	370K	TP	18Ω	100Ω	
V4	50L6GT	NC	118Ω	†275Ω	†33K	370K	TP	68Ω	100Ω	

ALL MEASUREMENTS TAKEN WITH PHONO MOTOR DISCONNECTED.
† MEASURED FROM OUTPUT OF M2
NC NO CONNECTION
TP TIE POINT

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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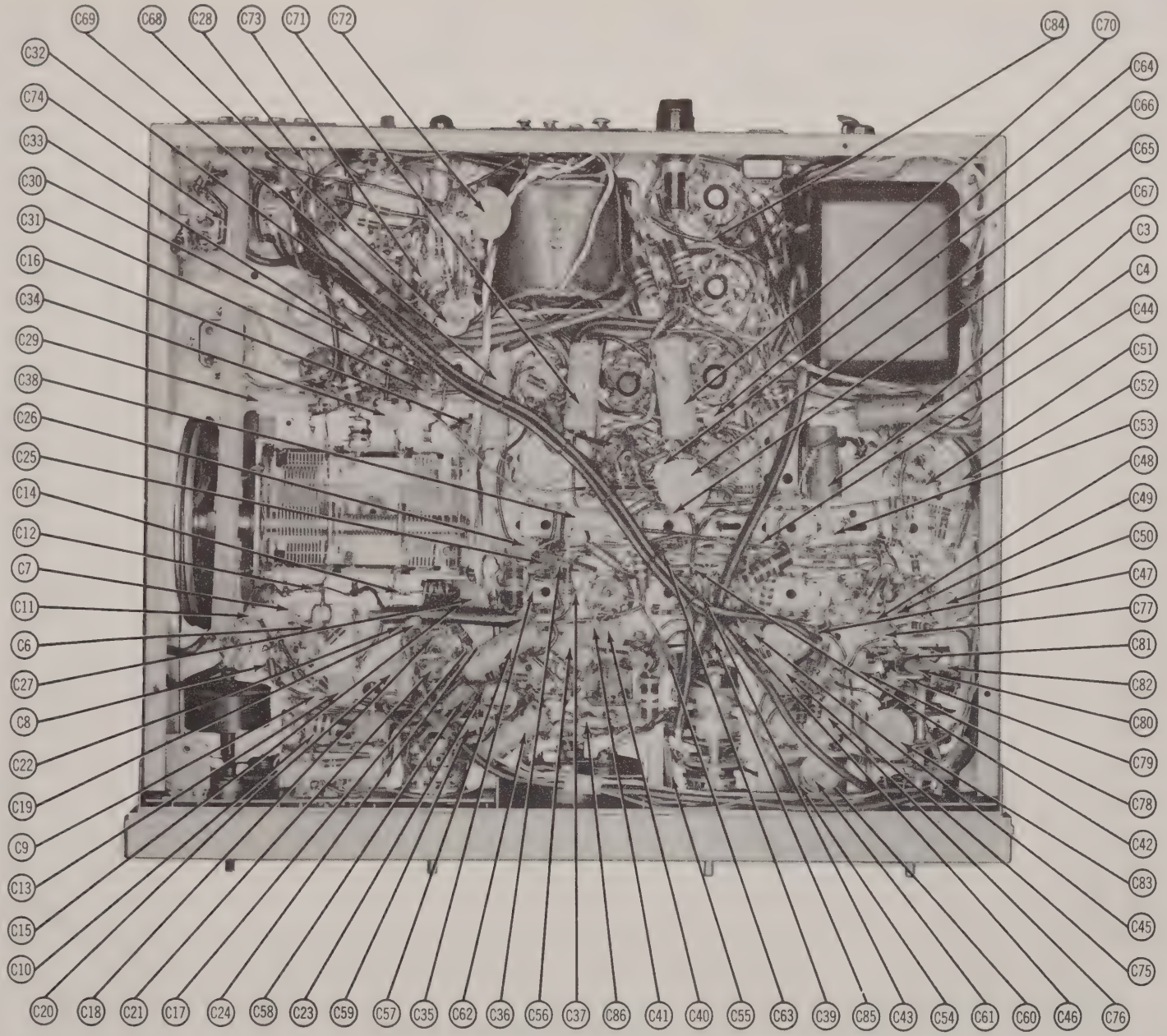
DAVID BOGEN MODEL RR550

DAVID BOGEN MODEL RR550

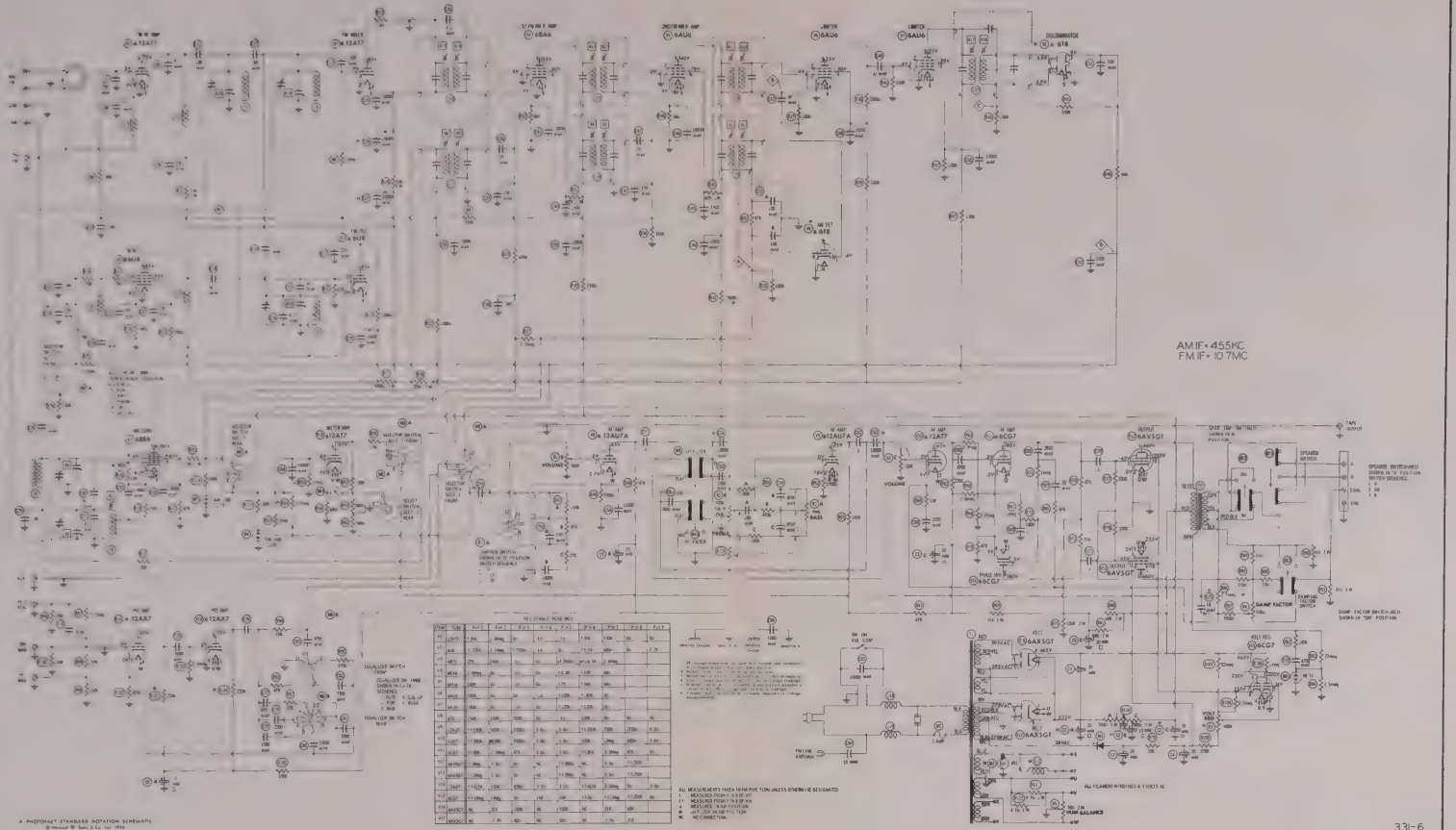
DAVID BOGEN MODEL RR550

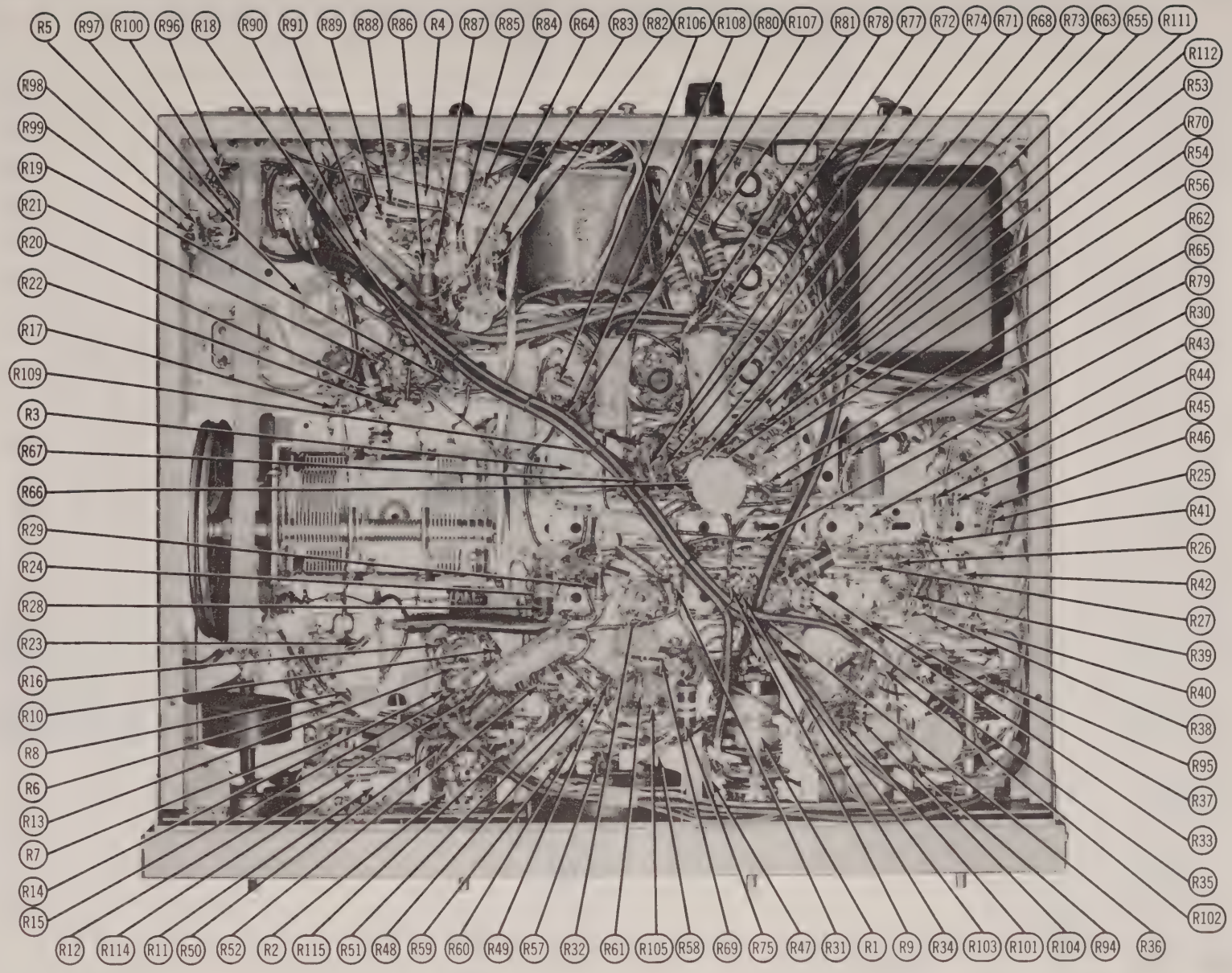
TRADE NAME	David Bogen Model RR550		
MANUFACTURER	David Bogen Co., Inc., 29 Ninth Ave., New York 14, N.Y.		
TYPE SET	AC Operated FM-AM Superheterodyne Receiver		
TUBES	Seventeen		
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING	1.48 Amp. @ 117 Volts AC
TUNING RANGE-BROADCAST	530KC-1650KC	FREQ.MOD.	88MC-108MC

"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed." "Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1956 by Howard W. Sams & Co., Inc., Indianapolis 5, Indiana, U. S. of America. Copyright under international Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America



CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION


AM IF • 455KC
FM IF • 10.7MC
A PHOTOFACT STANDARD NOTATION SCHEMATIC
© Howard W. Sams & Co., Inc. 1958
331-6



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

DAVID BOGEN
MODEL RR550

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Allow 15 minute warm-up period for receiver and equipment.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1.	.01MFD	High side to pin 7 (grid) of 6BE6 (V3). Low side to chassis.	455KC (400~Mod)	AM	Tuning gang fully open	DC probe to point Ⓐ. Common to chassis.	A1, A2, A3, A4, A5, A6	Adjust for maximum deflection.
2.	Direct	High side to AM antenna terminal. Low side to chassis.	600KC	"	600KC	"	A7	"
3.	"	"	1500KC	"	1500KC	"	A8, A9	"

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4.	.01MFD	High side to pin 2 (grid) of 12AT7 (V1). Low side to chassis.	10.7MC (Unmod)	FM	Point of non-interference	DC probe thru 100K to point Ⓑ. Common to chassis.	A10, A11, A12, A13, A14, A15	Adjust for maximum deflection.
5.	"	"	"	"	"	DC probe thru 100K to point Ⓒ. Common to chassis.	A16	"
6.	"	"	"	"	"	DC probe thru 100K to point Ⓓ. Common to chassis.	A17	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60~ modulation and 450KC sweep. Use 120~ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
4.	.01MFD	High side to pin 2 (grid) of 12AT7 (V1). Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. thru 100K to point Ⓑ. Low side to chassis.	A10, A11, A12, A13, A14, A15	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
5.	"	"	"	"	"	Vert. Amp. thru 100K to point Ⓒ. Low side to chassis.	A16	"
6.	"	"	"	"	"	Vert. Amp. thru 100K to point Ⓓ. Low side to chassis.	A17	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A16 for maximum amplitude and straightness of crossover lines.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
7.	Fig. 3	Thru dummy to FM antenna terminals.	106MC	FM	106MC	DC probe thru 100K to point Ⓑ. Common to chassis.	A18, A19	Short AFC to chassis. Adjust for maximum deflection in order given.
8.	"	"	90MC	"	90MC	"		Short AFC to chassis. Check for tracking.

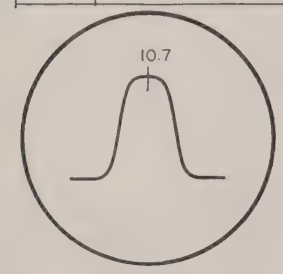


FIG. 1

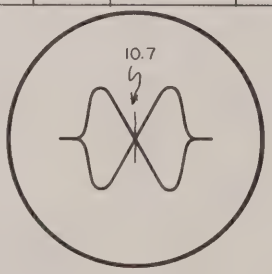


FIG. 2

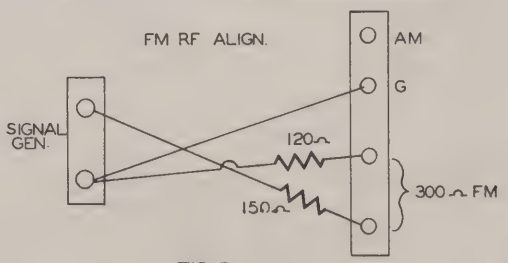
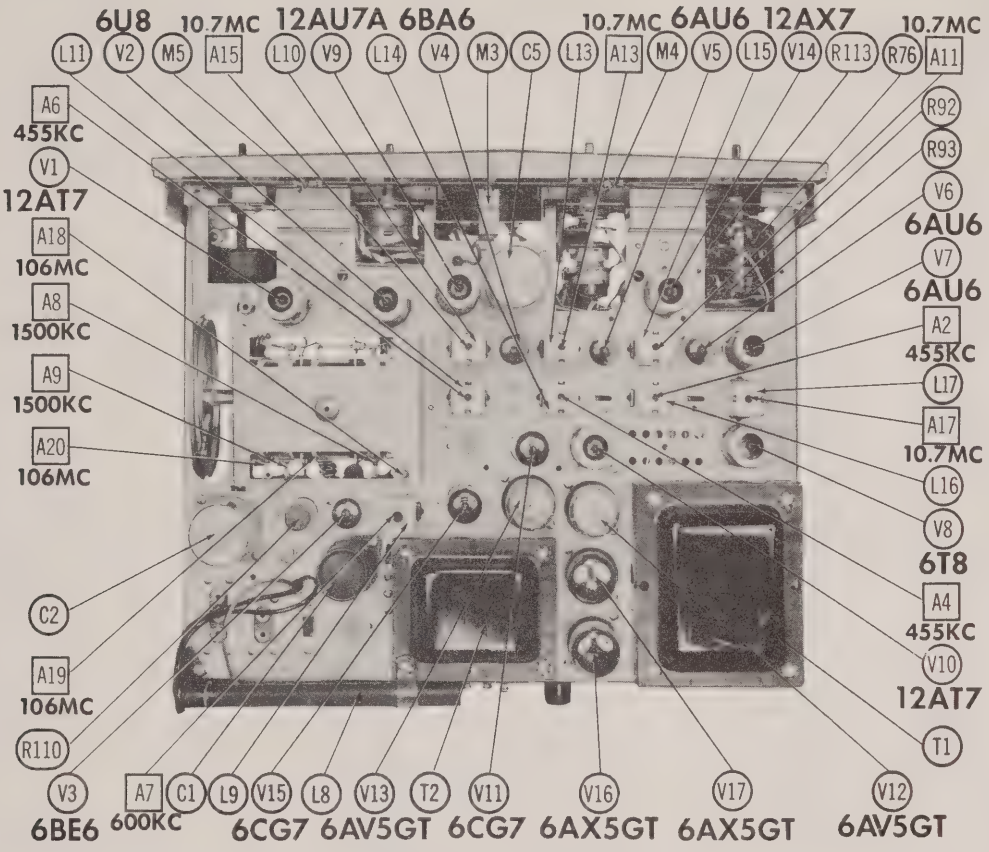
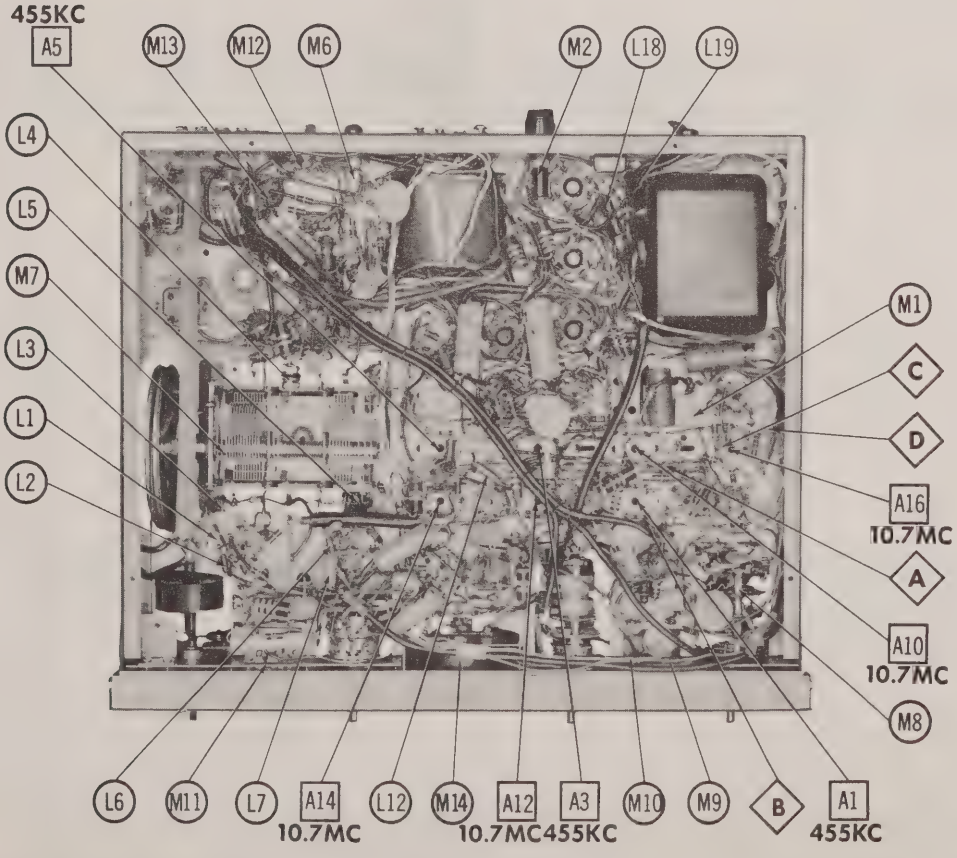


FIG. 3



CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW-INDUCTOR AND ALIGNMENT IDENTIFICATION

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	FM RF Amp. -FM Mixer	12AT7	
V2	AFC-FM Osc.	6U8	
V3	AM Converter	6BE6	
V4	1st IF Amplifier	6BA6	
V5	2nd IF Amplifier	6AU6	
V6	3rd FM IF Amplifier	6AU6	
V7	Limiter	6AU6	
V8	Disc. -AM Det. -AVC	6T8	Note 1
V9	AF Amplifier	12AU7A	
V10	AF Amp. -Meter Amp.	12AT7	
V11	AF Amp. -Phase Inv.	6CG7	
V12	Output	6AV5GT	
V13	Output	6AV5GT	
V14	Preamplifier	12AX7	
V15	Volt. Regulator	6CG7	
V16	Rectifier	6AX5GT	
V17	Rectifier	6AX5GT	

Note 1: 6BJ7 may be used in this application.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA David Bogen PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	20	400		AFH1-45	A046	FP144	TM-20-400	S-260	TVL-1660
C2A	■20	350	Note 1	AFH3-153-30	D042	FP343. 6		Q-250	R2278*
B	▲10	350	Note 1						
C	▲30	350	Note 1						
C3	20	50		PRS50V20	BR205	TC36	TD-25-50	FM-0525	TVA-1306
C4	20	50		PRS50V20	BR205	TC36	TD-25-50	FM-0525	TVA-1306
C5A	▲10	350		AFH4-19-10		FP474. 5		Q-035	R2290*
B	10	350							
C	▲20	450							
D	■20	450							

Note 1: In some versions C2A is 30MFD, and C2B is 20MFD and C2C is 10MFD.
* Non catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA David Bogen PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C6	22				TCA-22		N330K-220			
C7	220			DI-00022	DD-221	G051	811-221	UC-5322	5GA-T22	
C8	4. 7						N330A-4R7			
C9	220			DI-00022	DD-221	G051	811-221	UC-5322	5GA-T22	
C10	. 047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C11	100			BPD-0001	DD-101	G042	801-101	UC-531	5GA-T1	
C12	. 68				TCZ-R68	TZ02	NP0A-0R68			
C13	1000			BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C14	1. 2									
C15	47			N750-DI47	TCN-47	N033	N750K-470	NT-5447	5TCU-Q47	
C16	4. 7						N330A-4R7			
C17	220			DI-00022	DD-221	G051	811-221	UC-5322	5GA-T22	

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA David Bogen PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C18	47			N750-DI47	TCN-47	N033	N750K-470	NT-5447	5TCU-Q47	
C19	22			N750-DI22	TCN-22	N024	N750K-220		5TCU-Q22	
C20	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C21	220			DI-00022	DD-221	G051	811-221	UC-5322	5GA-T22	
C22	220			DI-00022	DD-221	G051	811-221	UC-5322	5GA-T22	
C23	. 047	200		BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C24	220		Note 2	DI-00022	DD-221	G051	811-221	UC-5322	5GA-T22	
C25	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C26	10000		Note 2	BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C27	10000		Note 2	BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C28	1. 2									
C29	. 047	200		BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C30	47			N750-DI47	TCN-47	N033	N750K-470	NT-5447	5TCU-Q47	
C31	8. 2			NP0-DI8. 2		Z016	NP0A-8R2			
C32	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C33	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C34	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C35	1. 2									
C36	33			NP0-DI33	DD-330	Z029	831-330	ZT-5433	5TCC-Q33	
C37	150			NP0-DI150	DD-151	TZ34	811-151	ZT-5315	5TCC-T15	
C38	. 047	200		BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C39	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C40	1500			BPD-0015	DD-152	K071	801-0015	DC5215	5HK-D15	
C41	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C42	33			NP0-DI33	DD-330	Z029	831-330	ZT-5433	5TCC-Q33	
C43	150			NP0-DI150	DD-151	TZ34	811-151	ZT-5315	5TCC-T15	
C44	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C45	1500			BPD-0015	DD-152	K071	801-0015	DC5215	5HK-D15	
C46	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C47	47			NP0-DI47	DD-470	Z033	831-470	UC-5447	5GA-Q47	
C48	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C49	47			NP0-DI47	DD-470	Z033	831-470	UC-5447	5GA-Q47	
C50	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C51	100			BPD-0001	DD-101	G042	801-101	UC-531	5GA-T1	
C52	1000			BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C53A	100		†	†PA-97-1	†PC-50	†111TM1	†1403-01	UC-531	†D-1	
B	100							UC-531		
C54	. 1	200	Note 3	P288N-1	DF-104	CUB2P1		PT401	2TM-P1	
C55A	150		♦	BPD-00015	DD-151	G046	811-151	UC-5315	♦102C26	
B	10000			BPD-01	DD-103	K082	811-01	DC511		
C56	15000			BPD-015	DD16-153	CUB6S15	821-015	PT6115	5HK-S15	
C57	. 1	200		P288N-1	DF-104	CUB2P1		PT401	2TM-P1	
C58	10000		Note 4	BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C59A	100			BPD-0001	DD-101	G042	801-101	UC-531	5GA-T1	
B	4700		‡	BPD-0047	DD-472	K079	811-0047	UC-5247	5HK-D47	
C	4700			BPD-0047	DD-472	K079	811-0047	UC-5247	5HK-D47	
C60	1000		Note 5	BPD-001	DD-102	K069	801-001	DC521	5GA-T68	
C61	3900		Note 6	BPD-004	D6-402	K078	811-004	UC-5240	5GA-D39	
C62	. 1	200		P288N-1	DF-104	CUB2P1		PT401	2TM-P1	

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	David Bogen PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C63	15000		Note 7	BPD-015	DDI6-153	CUB6SI5	821-015	PT6115	5HK-S15	
C64	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C65	4700			BPD-0047	DD-472	K079	811-0047	UC-5247	5HK-D47	
C66	3900			BPD-004	D6-402	K078	811-004	UC-5240	5GA-D39	
C67	22			N750-D122	TCN-22	N024	N750K-220		5TCU-Q22	
C68	2200			BPD-0022	D6-222	K073	811-0022	UC-5222	5HK-D22	
C69	.1	200		P288N-1	DF-104	CUB2P1		PT401	2TM-P1	
C70	.1	600		P688N-1	DF-104	CUB6P1		PT601	6TM-P1	
C71	.1	600		P688N-1	DF-104	CUB6P1		PT601	6TM-P1	
C72	4700			BPD-0047	DD-472	K079	811-0047	UC-5247	5HK-D47	
C73	10		Note 2	BPD-00001	DD-100	G018	831-100	UC-541	5GA-Q1	
C74	10			BPD-00001	DD-100	G018	831-100	ZT-541	5TCC-Q1	
C75	15000			BPD-015	DDI6-153	CUB6SI5	821-015	PT6115	5HK-S15	
C76	.1	200		P288N-1	DF-104	CUB2P1		PT401	2TM-P1	
C77	470			BPD-00047	DD-471	K060	811-471	UC-5347	5GA-T47	
C78	2200			BPD-0022	D6-222	K073	811-0022	UC-5222	5HK-D22	
C79	1500			BPD-0015	DD-152	K071	801-0015	DC5215	5HK-D15	
C80	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C81	3300			BPD-0033	D6-332	K077	811-0033	UC-5233	5HK-D33	
C82	3300			BPD-0033	D6-332	K077	811-0033	UC-5233	5HK-D33	
C83	4700			BPD-0047	DD-472	K079	811-0047	UC-5247	5HK-D47	
C84	15			HVD-15-15	DD-150	VQ15	1R5KV-150	DC30415	10GA-Q15	
C85	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C86	1000			BPD-001	DD-102	K069	801-001	DC521	5HK-D1	

† Items C53A, C53B and R43 are combined in one unit.
♦ Items C55A, C55B, R47A, R47B and R47C are combined in one unit.
‡ Items C59A, C59B, C59C, R50A, R50B and R50C are combined in one unit.
Note 2: Not used in some versions.
Note 3: Some versions may use .01MFD unit in this application.
Note 4: Some versions may use .022MFD unit in this application.
Note 5: Some versions may use 680MMF unit in this application.
Note 6: Some versions may use 2700MMF unit in this application.
Note 7: Some versions may use .033MFD " " " " "

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	David Bogen PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A			S451B					Contour Switch
B	500K							Volume & Switch
C	100K							
R2A	1Meg		V371A	F1-51				Bass (Panel)
B	500K			R2-46				Treble (rear) Tap ⓐ 250K
R3A	500K		V275B	AB-60	A47-500K-Z	Q13-133	U48	Voltage Regulate (Note 1)
B	Shaft		Not Req.	AK-1	FKS-1/4	Not Req.		Attach to R3A
R4	100Ω		V388				R100L	Damping Factor
R5	50Ω	2	V113				C50P	Hum Balance

Note 1: Some versions may use an alternate control part no. V275A in this application.

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	David Bogen PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC ⓐ1.48A	555VCT ⓐ.125A	560VCT ⓐ.110A TAP ⓐ 38V .00013A	6.5VAC ⓐ1.2A	T3143					
	SEC. 4	SEC. 5		SEC. 6						
	6.3VAC ⓐ5.5A	6.5VAC ⓐ.6A		6.5VAC ⓐ2.84A						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	David Bogen PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	11.4KΩ	16Ω and 8Ω	T2119-1						

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	David Bogen PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	RF Coil	0Ω		U436				
L2	RF Choke	0Ω		U420				1.7 Microhenries
L3	FM Ant. Coil	0Ω		U433				
L4	FM RF Coil	0Ω		U434				
L5	FM Osc. Coil	0Ω		U435				Tapped
L6	Cathode Choke	0Ω		U432	19-1000		4602	1.1 Microhenries
L7	RF Choke	3Ω		U507				3.3 Microhenries; IRC Part #CLA
L8	AM Loop Stick	.5Ω		H452A				
L9	AM Osc. Coil	3.6Ω		H454	14-1412		70-Osc	Tapped ⓐ .4Ω
L10	1st. FM IF	.6Ω	.6Ω	H355	16-3487	FM-254	1463	
L11	1st. AM IF	16Ω	16Ω	H297	16-6758	BC-352	12-C1	
L12	Fil. Choke	0Ω						1.9 Microhenries, not used in some versions.
L13	2nd FM IF	.6Ω	.6Ω	H355	16-3487	FM-254	1463	
L14	2nd AM IF	16Ω	16Ω	H297	16-6758	BC-352	12-C1	
L15	3rd FM IF	.6Ω	.6Ω	H355	16-3487	FM-254	1463	
L16	3rd AM IF	16Ω	16Ω	H297	16-6758	BC-353	12-C2	
L17	Discriminator	.6Ω	.8ΩCT	H295	17-3494	FM-253	1464	
L18	Line Choke	0Ω		U512				
L19	Line Choke	0Ω		U512				

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	David Bogen PART No.	IRC PART No.	
R6	100K			BTS-100K	
R7	33K	2		BTB-33K	
R8	1Meg			BTS-1Meg	
R9	330K			BTS-330K	
R10	22K			BTS-22K	
R11	5000Ω	7		PW7-5000	
R12	1000Ω			BTS-1000	
R13	220Ω			BTS-220	
R14	220K			BTS-220K	
R15	2200Ω			BTS-2200	
R16	680Ω			BTS-680	
R17	100K			BTS-100K	
R18	22K			BTS-22K	
R19	150Ω			BTS-150	
R20	15K	2		BTB-15K	
R21	47K			BTS-47K	
R22	1000Ω			BTS-1000	
R23	10Ω			BTS-10	
R24	33K	1		BTA-33K	
R25	2.2Meg			BTS-2.2Meg	
R26	100K			BTS-100K	
R27	2.2Meg			BTS-2.2Meg	
R28	220Ω	2		BTB-220	
R29	470K			BTS-470K	
R30	3300Ω			BTS-3300	
R31	47K	1		BTA-47K	
R32	68Ω			BTS-68	
R33	5600Ω	2		BTB-5600	
R34	100K			BTS-100K	
R35	47K	1		BTA-47K	
R36	68Ω			BTS-68	
R37	100K			BTS-100K	
R38	2200Ω			BTS-2200	
R39	100K			BTS-100K	
R40	100K			BTS-100K	
R41	120K			BTS-120K	
R42	100K			BTS-100K	
R43	47K		†	BTS-47K	
R44	100K			BTS-100K	
R45	100K			BTS-100K	
R46	68K			BTS-68K	
R47A	150K			BTS-150K	
B	47K		♦	BTS-47K	
C	27K			BTS-27K	
R48	47K			BTS-47K	
R49	3300Ω			BTS-3300	
R50A	100K			BTS-100K	
B	470K		‡	BTS-470K	
C	100K			BTS-100K	
R51	100K			BTS-100K	
R52	2700Ω			BTS-2700	
R53	1Meg			BTS-1Meg	Note 1
R54	2.2Meg			BTS-2.2Meg	Note 2
R55	1Meg			BTS-1Meg	
R56	15K			BTS-15K	
R57	100K 5%			BTS-100K 5%	
R58	680Ω 5%			BTS-680 5%	
R59	680Ω 5%			BTS-680 5%	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	David Bogen PART No.	IRC PART No.	
R60	560Ω 5%			BTS-560 5%	
R61	47K			BTS-47K	
R62	330K			BTS-330K	
R63	3.3Meg			BTS-3.3Meg	
R64	10K			BTS-10K	
R65	47K			BTS-47K	
R66	1.8Meg			BTS-1.8Meg	
R67	1Meg			BTS-1Meg	
R68	2.2Meg			BTS-2.2Meg	
R69	15K	1		BTA-15K	
R70	47K			BTS-47K	
R71	1Meg			BTS-1Meg	
R72	180K			BTS-180K	
R73	51K 5%			BTS-15K 5%	
R74	47K			BTS-47K	
R75	100K	2		BTB-100K	
R76	100K			BTS-100K	
R77	220K			BTS-220K	
R78	220K			BTS-220K	
R79	33K			BTS-33K	
R80	68K	2		BTB-68K	
R81	68K	2		BTB-68K	
R82	100K			BTS-100K	
R83	22Meg			BTS-22Meg	
R84	1.5Meg			BTS-1.5Meg	
R85	150Ω			BTS-150	
R86	2.7Meg	1		BTA-2.7Meg	
R87	3300Ω			BTS-3300	
R88	10Ω			BTS-10	
R89	15Ω			BTS-15	
R90	1Ω	2		BW2-1	
R91	.47Ω	1		BW1-.47	
R92	22K			BTS-22K	
R93	47K			BTS-47K	
R94	10K			BTS-10K	
R95	470K			BTS-470K	
R96	120K			BTS-120K	
R97	2.2Meg			BTS-2.2Meg	
R98	150K			BTS-150K	
R99	150K			BTS-150K	
R100	150K			BTS-150K	
R101	220K			MBC-220K	Note 3
R102	820Ω			BTS-820	
R103	3.3Meg			BTS-3.3Meg	
R104	220K			MBC-220K	Note 3
R105	100K			BTS-100K	
R106	1Meg			BTS-1Meg	
R107	22Meg			BTS-22Meg	
R108	2.2Meg			BTS-2.2Meg	
R109	270K			BTS-270K	
R110A	500Ω	5	*	PW7-500	
B	500Ω	5		PW7-500	
C	500Ω	5		PW7-500	
R111	4.7Ω	1		BW1-4.7	
R112	4.7Ω	1		BW1-4.7	
R113	100K			BTS-100K	
R114	100K			BTS-100K	
R115	15K			BTS-15K	

† Items R43, C53A, C53B are combined in one unit.
♦ Items R47A, R47B, R47C, C55A, C55B are combined in one unit.
‡ Items R50A, R50B, R50C, C59A, C59B, C59C are combined in one unit.
* Items R110A, R110B, R110C are combined in one unit.
Note 1. Some versions use a 680K resistor in this application.
Note 2. Not used in some versions.
Note 3. Low noise deposited carbon type resistor.

PARTS LIST AND DESCRIPTIONS (Continued)

FUSES

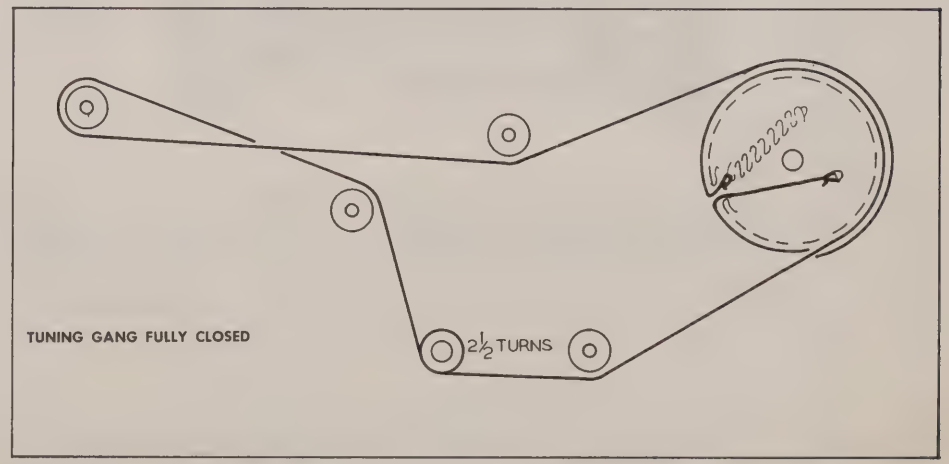
ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			David Bogen PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	3AG Slo-Blo	2A 125V			313002. (3AG Slo-Blo 2A)	342001	MDL2	HKP

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA						NOTES
	CURRENT	David Bogen PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	
M1	.00013A		1002A	RS050	8S35	8J1	50	

MISCELLANEOUS

ITEM No.	PART NAME	David Bogen PART No.	NOTES
M3	Dial Light		#51 (not used in some versions)
M4	Neon Light		NE-51, FM Dial Pointer
M5	Neon Light		NE-51, AM Dial Pointer
M6	Neon Light		NE-51, Damping Indicator
M7	Tuning Cap.		5 Gang (AM Sections: 26-535MMF, 24-195MMF)
M8A	Switch	S449B	Selector (Rotary Wafer Type)
B	Switch		Phono Equalizer (Rotary, Wafer Type)
M9	Switch	S381	Lo Filter (DPDT-Slide Type)
M10	Switch	S381	Hi Filter (DPDT-Slide Type)
M11	Switch	S466	Speaker Selector (3 Position - Slide Type)
M12	Switch	S381	Speaker Impedance Selector (DPDT-Slide Type)
M13	Switch	S381	Damping Factor (DPDT-Slide Type)
M14	Meter	H453	Tuning Indicator



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EMERSON MODELS 1176, 1177, 1178, 1179, 1180, 1181, 1186, 1187, 1188, 1189 (Ch. 120292-P, -V, 120293-T, -X, 120299-V, 120300-X)

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EMERSON MODEL 1178 (Ch. 120292-V)

TRADE NAME	Emerson	MODELS	CHASSIS	TYPE TUNER
		1176, 1178, 1180	120292-P	470869
		1176, 1178, 1180	120292-V	470868
		1177, 1179, 1181	120293-T	470870
		1177, 1179, 1181	120293-X	470892
		1186, 1188	120299-V	470889
		1187, 1189	120300-X	470892

MANUFACTURER	Emerson Radio & Phonograph Corp., 14th. & Coles Sts., Jersey City 2, N.J.
TYPE SET	Television
TUBES	Eighteen
POWER SUPPLY	110-120 Volts AC-60 Cycle RATING 1.61 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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EMERSON MODELS 1176, 1177, 1178, 1179, 1180, 1181, 1186, 1187, 1188, 1189 (Ch. 120292-P, -V, 120293-T, -X, 120299-V, 120300-X)

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DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 4 push-on type control knobs from front panel of cabinet, and 4 push-on type control knobs from side panel of cabinet.

2. Insert fingers into holes of mask, pull mask out and then up to clear bottom channel and remove.

3. Remove screws which hold tuner support to cabinet and screw which holds contrast, off/on-volume control to cabinet, also remove screws holding ears of the picture tube bracket.

4. Remove 8 metal screws. Remove rear cover.

5. Remove 2 metal screws. Remove antenna terminal bracket.

6. Remove 2 nuts which hold side control to cabinet.

7. Disconnect speaker leads.

8. Remove screws holding chassis mounting board to chassis.

9. On table models lift cabinet from mounting board. On console models remove chassis with mounting board from cabinet.

10. Remove 2 speaker nuts. Remove speaker.

MODEL	CHASSIS
1178	120292-V

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SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removal of the channel selector and fine tuning knobs. The adjustments are accessible, one at a time, thru the small hole in the cabinet above and slightly to the left of the channel selector shaft.

PICTURE TUBE SAFETY GLASS CLEANING

Remove 4 push-on type control knobs, insert fingers into holes of mask, and pull mask out and then up to clear bottom channel.
The safety glass is held in place by 8 small brackets. Remove 4 brackets (2 on each side) and loosen the 4 brackets (2 at the top and 2 at the bottom). DO NOT REMOVE BRACKETS. Loosen enough to allow glass to move freely. The upper corners of the safety glass are cut out. Place fingers of each hand on each corner cut-out so thumbs are free to move brackets toward each opening. The safety glass may now be removed.

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

SPECIAL ADJUSTMENTS

Picture Stabilizer Control Adjustment:

In normal signal areas the picture stabilizer control (R6) should be set at its maximum clockwise position. In noisy fringe areas rotate R6 counter clockwise for best sync stability.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horizontal oscillator can be made from the rear panel of the set. Set the horizontal hold control at the center of its range and adjust the horizontal frequency slug (B1) until picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the sound IF discriminator secondary (L15) located on top of chassis.

FUSES

One fuse is used for LV power supply protection. (For location see tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

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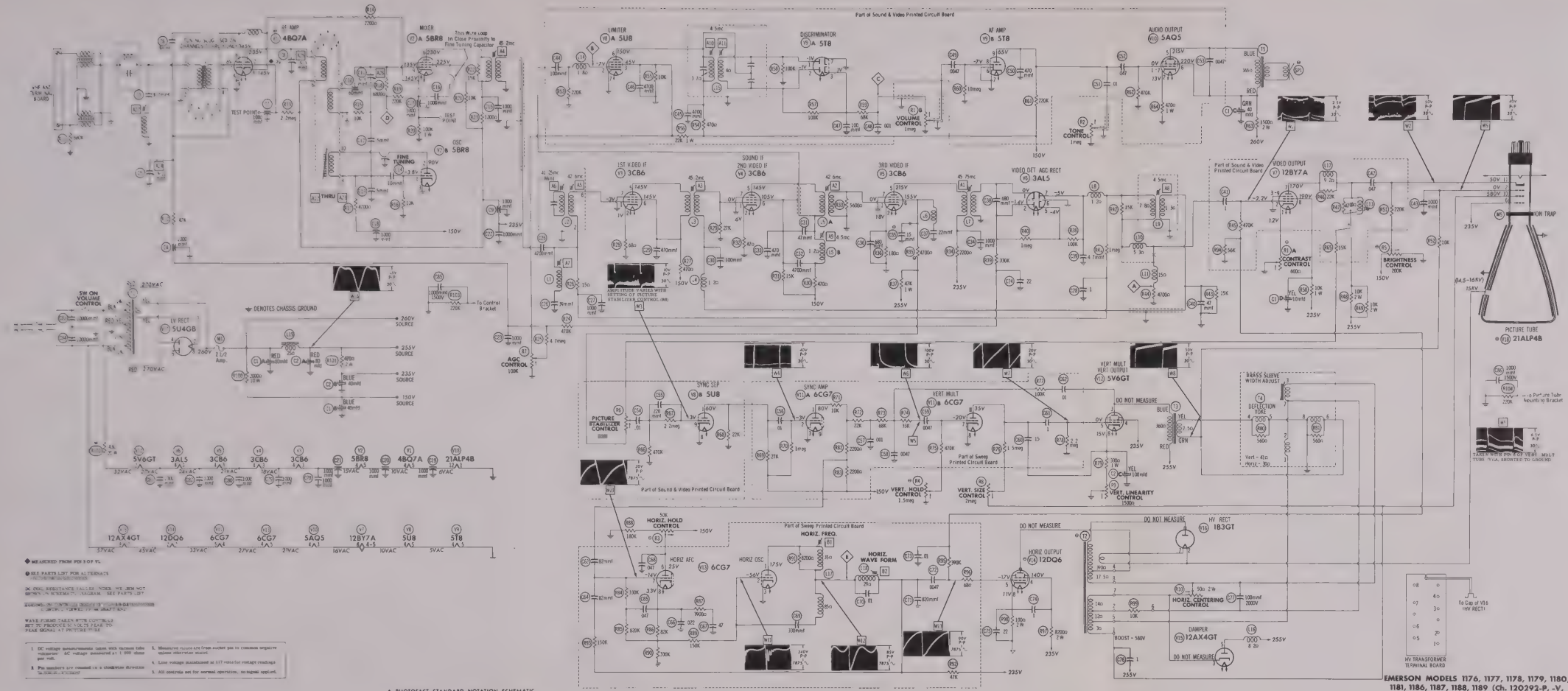
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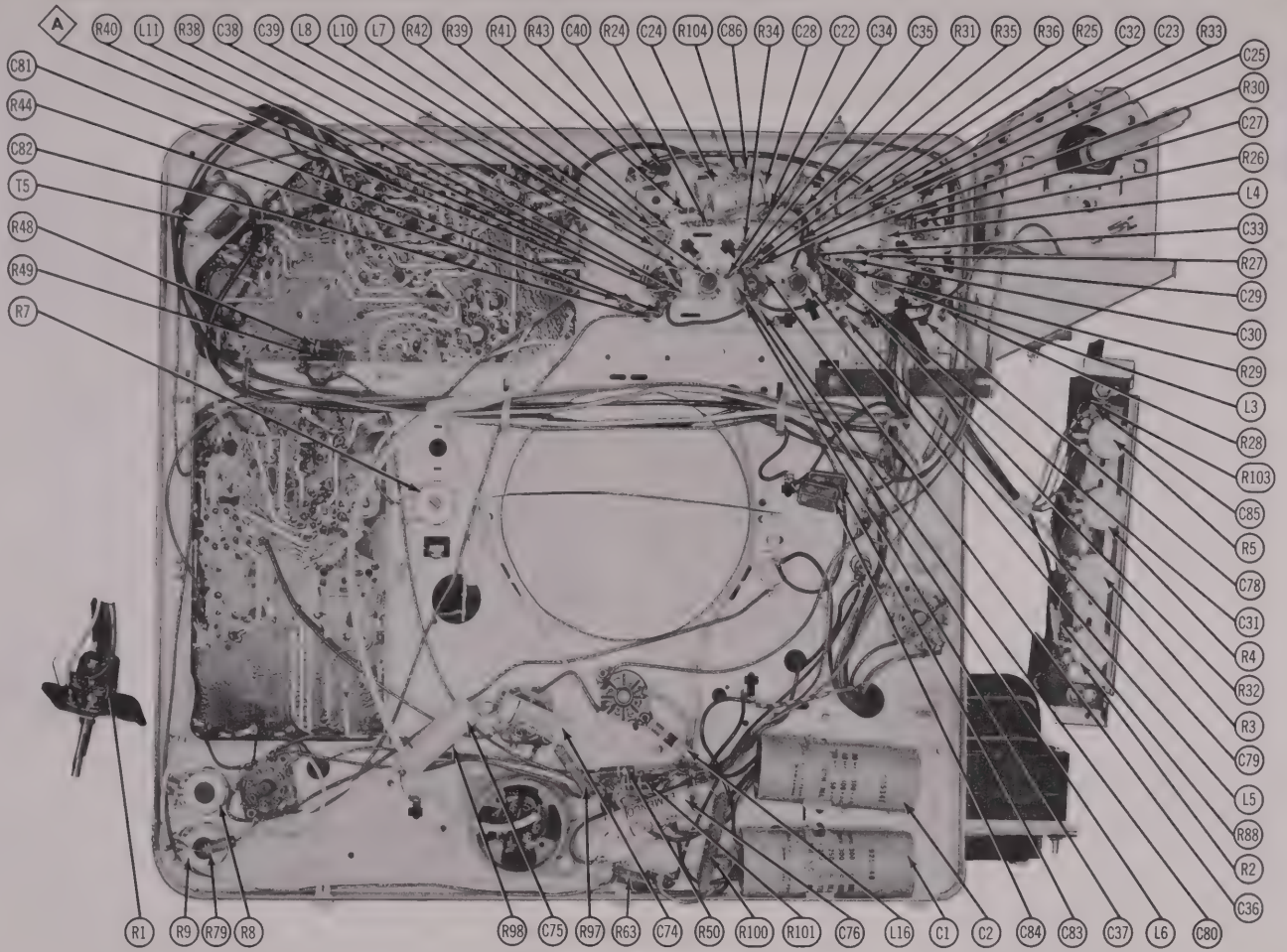
CHASSIS TOP VIEW

EMERSON MODELS 1176, 1177, 1178, 1179, 1180, 1181, 1186, 1187, 1188, 1189 (Ch. 120292-P, -V, 120293-I, -X, 120299-V, 120300-X)



CHASSIS-BOTTOM VIEW

TUBE PLACEMENT CHART

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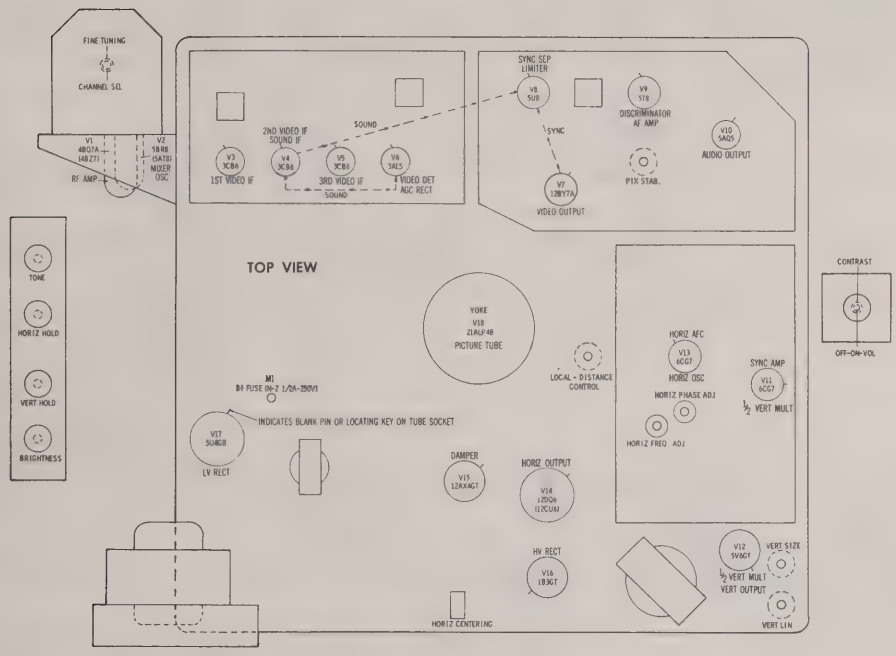


TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

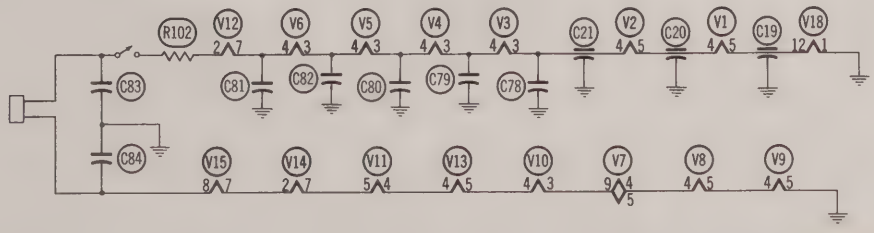
POWER SUPPLY FAILURE
No raster, no sound - **V17, Fuse (M1)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V2, V3, V4, V5, V6**
No pic, no sound, has snow - **V1, V2, V3**
No pic, has sound, has raster - **V7, V18**
Has pic, no sound - **V4, V5, V6, V8, V9, V10**

SYNC FAILURE
No vert. sync - **V11, V12**
No horiz. sync - **V11, V13**
No vert. or horiz. sync - **V8, V11**

SWEEP FAILURE
No raster, has sound - **V13, V14, V15, V16, V18**
No vertical deflection - **V11, V12**
Poor vert. linearity or foldover - **V11, V12**
Poor horiz. linearity or foldover - **V13, V14, V15**
Narrow picture - **V13, V14, V15, V16, V17**
Vert. off freq. - **V11, V12**
Horiz. off freq. - **V11, V13**

NOTE: Since this receiver employs tubes used in a series filament network, an open filament in any tube in series will cause the set to be inoperative (See circuit below).



ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Picture tube may be removed from chassis for easier slug adjustments. The high voltage lead should be securely taped and kept away from chassis. Keep picture tube socket on tube to complete filament string.

VIDEO IF ALIGNMENT

Connect the negative lead of a 3 volt battery to the ungrounded side of C24. Connect the positive lead to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over converter tube. Low side to chassis.	Not used.	45.75MC (unmod)	10 or 12	USE VTVM DC probe to point Ⓐ. Common to chassis.	A1	Attenuate generator output for not more than -2 volts at VTVM. Adjust for maximum deflection.
2.	"	"	"	42.6MC	"	"	A2, A5	"
3.	"	"	"	45.2MC	"	"	A3, A4	"
4.	"	"	"	41.25MC	"	"	A6	Increase generator output for desirable reading and adjust A6 for MINIMUM deflection.
5.	"	"	"	47.25MC (400∿ mod)	"	Vert. amp. thru 10K to point Ⓐ. Low side to chassis.	A7	Adjust for MINIMUM 400∿ indication on scope. Use high scope gain and increase generator output.
6.	"	"	44MC (10MC Swp)	41.25MC 45.75MC 47.25MC	"	"		Use only enough sweep generator output to produce usable pattern on scope. Check for response curve similar to Fig. 1. If necessary, SLIGHTLY retouch A1 thru A5 to obtain desired response. If video marker (45.75MC) is too high, readjust A3. Increase sweep generator and scope output to observe 41.25MC and 47.25MC trap markers. If necessary, retouch A6 for 41.25MC and A7 for 47.25MC trap markers.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Short Pin 1 (grid) of 3CB6 (V3) to chassis.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
7.	.01MFD	High side to pin 7 (plate) of 3AL5 (V6). Low side to chassis.	4.5MC (unmod)	Any	DC probe to point Ⓑ. thru 10K. Common to chassis.	A8, A9	Adjust for maximum deflection.
8.	"	"	"	"	DC probe to point Ⓒ thru 10K. Common to chassis.	A10, A11	Detune A11 for maximum negative deflection. Adjust A10 for maximum deflection. Readjust A11 for zero reading on VTVM. A positive and negative reading will be obtained on either side of the correct setting. Remove short from pin 1 of V3.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Short pin 1 (grid) of 3CB6 (V3) to chassis.
Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	.01MFD	High side to pin 7 (plate) of 3AL5 (V6). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. amp. thru 10K to point Ⓑ. Low side to chassis.	A8, A9	Adjust for curve of maximum amplitude and symmetry similar to Fig. 2.
8.	"	"	"	"	"	Vert. amp. thru 10K to point Ⓒ. Low side to chassis.	A10, A11	Adjust A10 for maximum amplitude and straightness of crossover lines as in Fig. 3. Adjust A11 so that 4.5MC occurs at center of crossover lines. SLIGHTLY retouch A10 for maximum amplitude and straightness of crossover lines. Remove short from pin 1 of V3.

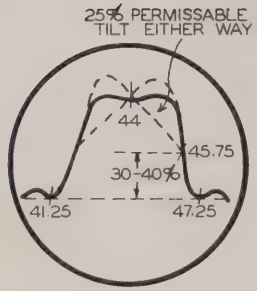


FIG. 1

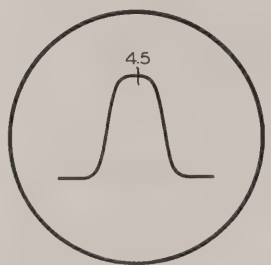


FIG. 2

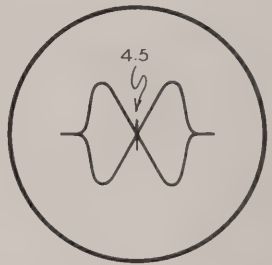


FIG. 3

ALIGNMENT INSTRUCTIONS (cont)

VHF OSCILLATOR ALIGNMENT

The channel oscillator adjustment screws are reached through a hole just above and slightly to the left of the channel switch shaft. The correct adjustment screw is accessible through this hole as the channel switch is turned to each VHF channel. Replace shield over converter tube.
Connect bias as under "Video IF Alignment".
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Two 120Ω carbon resistors.	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp)	205. 25MC 209. 75MC	12	Vert. amp. thru 10K to point (A). Low side to chassis.	A12	Advance gain so that the sound notch is visible on response curve. Adjust to place sound marker in trap notch. Video marker should fall at 30 to 40% of maximum on opposite slope of response curve as in Fig. 4.
			213MC (10MC Swp)	211. 25MC 215. 75MC	13		A13	
			201MC (10MC Swp)	199. 25MC 203. 75MC	11		A14	
			195MC (10MC Swp)	193. 25MC 197. 75MC	10		A15	
			189MC (10MC Swp)	187. 25MC 191. 75MC	9		A16	
			183MC (10MC Swp)	181. 25MC 185. 75MC	8		A17	
			177MC (10MC Swp)	175. 25MC 179. 75MC	7		A18	
			85MC (10MC Swp)	83. 25MC 87. 75MC	6		A19	
			79MC (10MC Swp)	77. 25MC 81. 75MC	5		A20	
			69MC (10MC Swp)	67. 25MC 71. 75MC	4		A21	
			63MC (10MC Swp)	61. 25MC 65. 75MC	3		A22	
			57MC (10MC Swp)	55. 25MC 59. 75MC	2		A23	

VHF RF AND MIXER ALIGNMENT

Connect bias as under "Video IF Alignment.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	Two 120Ω carbon resistors	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp)	205. 25MC 209. 75MC	12	Vert. amp. thru 100K to point (D). Low side to chassis.	A24, A25, A26	Adjust marker generator to provide readable marker. Be sure it does not distort the response curve. Adjust for response similar to Fig. 5.
11.	"	"	213MC (10MC Swp)	211. 25MC 215. 75MC	13	"		Check for response similar to Fig. 5 on all channels. If markers fall below 70% on any channel, make compromise adjustments of A24, A25 and A26 with channel switch set to that channel. Then recheck all other channels to see that they have not been seriously affected.
			201MC (10MC Swp)	199. 25MC 203. 75MC	11			
			195MC (10MC Swp)	193. 25MC 197. 75MC	10			
			189MC (10MC Swp)	187. 25MC 191. 75MC	9			
			183MC (10MC Swp)	181. 25MC 185. 75MC	8			
			177MC (10MC Swp)	175. 25MC 179. 75MC	7			
			85MC (10MC Swp)	83. 25MC 87. 75MC	6			
			79MC (10MC Swp)	77. 25MC 81. 75MC	5			
			69MC (10MC Swp)	67. 25MC 71. 75MC	4			
			63MC (10MC Swp)	61. 25MC 65. 75MC	3			
			57MC (10MC Swp)	55. 25MC 59. 75MC	2			

IF WAVE TRAP ADJUSTMENT

The IF wave trap should be tuned to minimize interference caused by signals which fall within the video IF band-pass (40-48 MC). Tune in a station on which the interference is noted and adjust A27 for minimum interference in the picture.

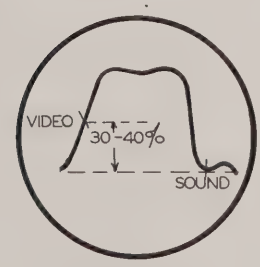


FIG. 4

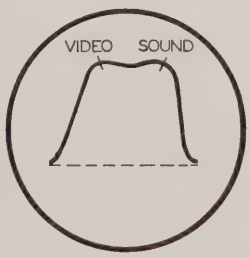


FIG. 5

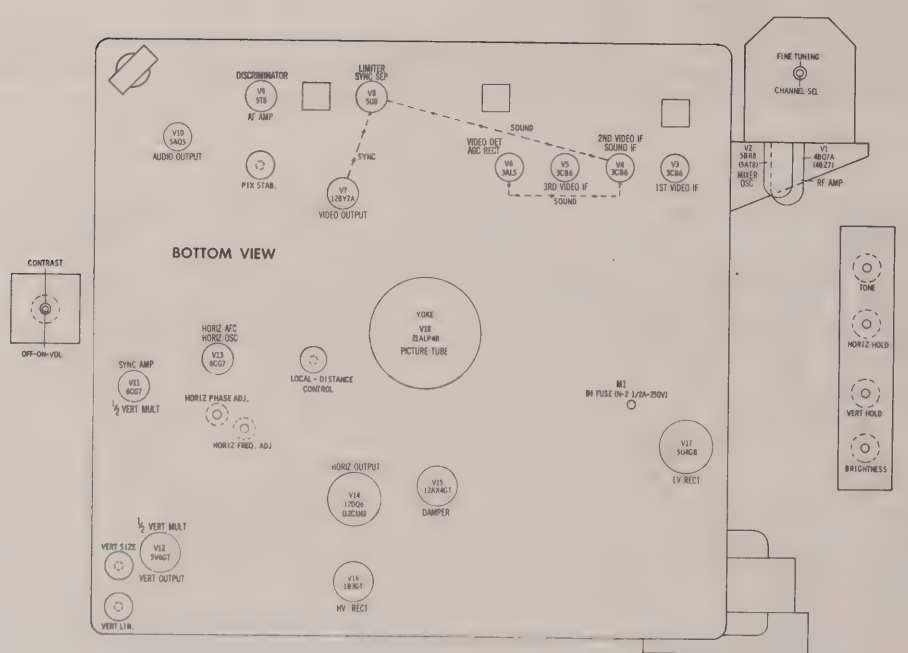
PROPERTY OF

EMERSON MODELS 1176, 1177, 1178, 1179, 1180, 1181, 1186, 1187, 1188, 1189 (Ch. 120292-P, -V, 120293-T, -X, 120299-V, 120300-X)

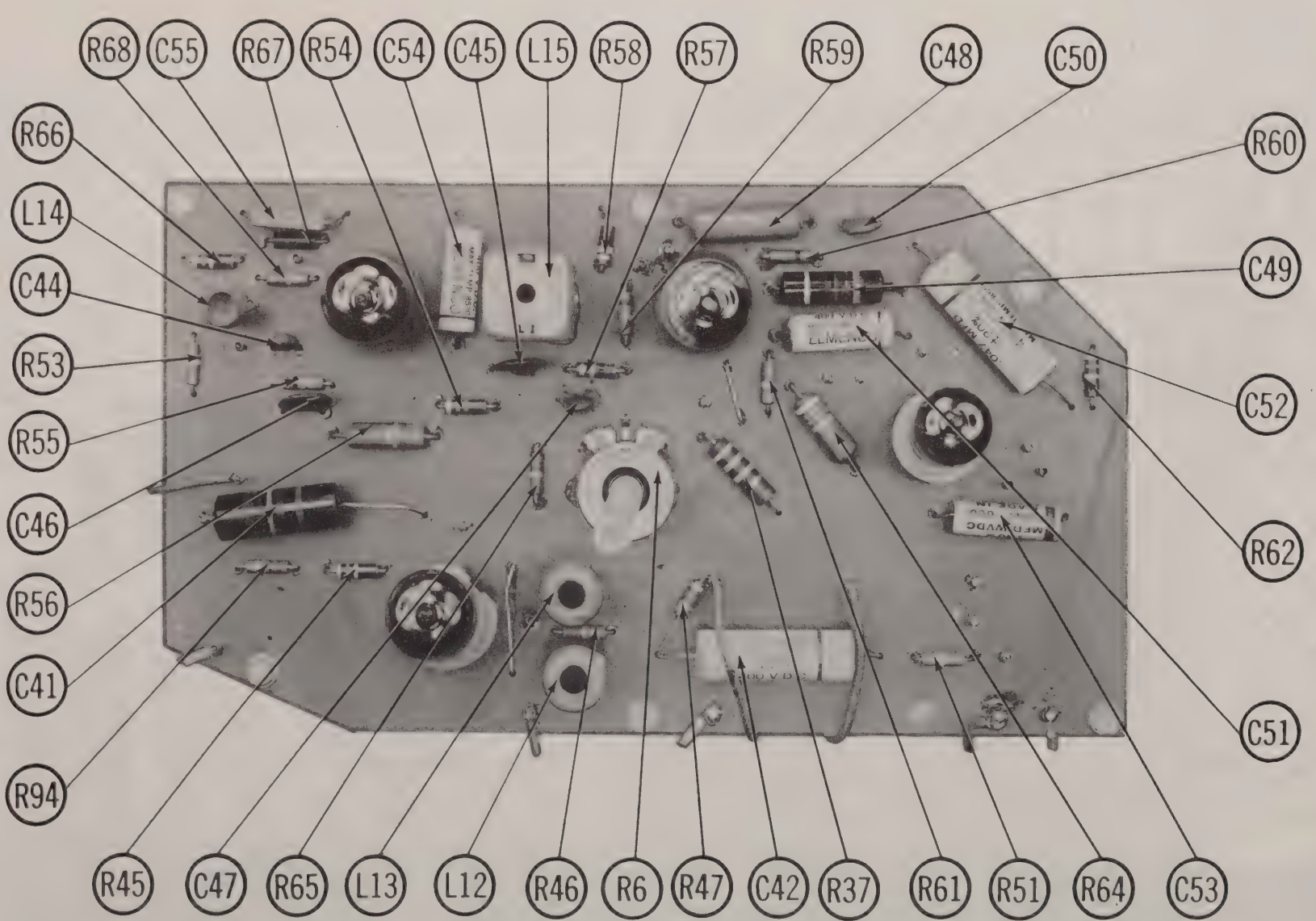
RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	4BQ7A	†500Ω	†2.2Meg	100K	2Ω	1Ω	100K	1.2Meg	0Ω	0Ω
V2	5BR8	10K	†6700Ω	0Ω	3Ω	2Ω	†1500Ω	†10K	100K	300K
V3	3CB6	1Meg	68Ω	3Ω	4Ω	†2500Ω	†2500Ω	0Ω		
V4	3CB6	2.6Ω	47Ω	4Ω	5Ω	†2500Ω	†17K	0Ω		
V5	3CB6	.1Ω	180Ω	5Ω	5.5Ω	†2200Ω	†50K	0Ω		
V6	3AL5	.1Ω	750K	5.5Ω	6Ω	100K	0Ω	4700Ω		
V7	12BY7A	●55Ω	500K	0Ω	2Ω	2Ω	3Ω	†5000Ω	†10K	0Ω
V8	5U8	†17K	220K	†15K	2Ω	1Ω	†2500Ω	0Ω	0Ω	2.5Meg
V9	5T8	100K	100K	200K	1Ω	0Ω	0Ω	0Ω	10Meg	†220K
V10	5AQ5	470K	470Ω	3Ω	3.5Ω	†1800Ω	†1500Ω	470K		
V11	6CG7	†16K	1Meg	0Ω	4Ω	4Ω	●▲2.5Meg	●750K	0Ω	NC
V12	5V6GT	NC	7Ω	†385Ω	†500Ω	2.2Meg	NC	6Ω	●500Ω	
V13	6CG7	†47K	480K	0Ω	4Ω	3.5Ω	†●20K	1.5Meg	400K	NC
V14	12DQ6	NC	3.5Ω	NC	†8500Ω	400K	NC	4Ω	100Ω	Top Cap ▲● 38Ω
V15	12AX4GT	NC	NC	INF.	NC	†30Ω	NC	3.5Ω	1.5Ω	
V16	1B3GT		PINS	1 - 8	HAVE	INFINITE	RESISTANCE			Top Cap ▲ 430Ω
V17	5U4GB	NC	15K	NC	15Ω	NC	20Ω	NC	15K	
V18	21ALP4B	0Ω	10K	Pin 6 †500Ω	Pin 10 ▲● 20Ω	Pin 11 †● 230K	Pin 12 1Ω			

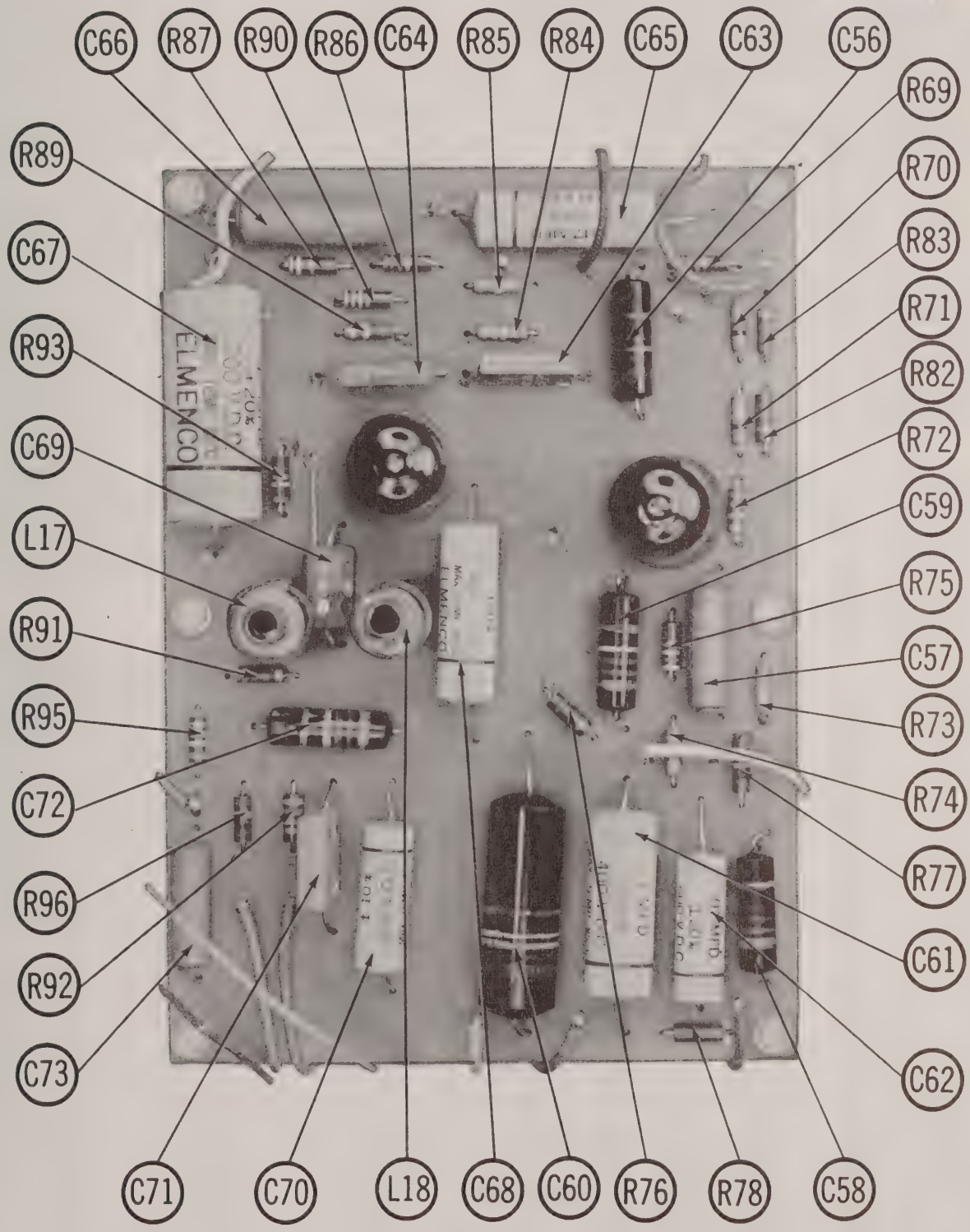
† MEASURED FROM PIN 8 OF V17.
● THIS READING WILL VARY. CONTROL SET FOR NORMAL OPERATION.
▲ MEASURED FROM PIN 3 OF V15.
NC NO CONNECTION
TP TIE POINT



TUBE PLACEMENT CHART



SOUND & VIDEO PRINTED CIRCUIT



VERTICAL & HORIZONTAL SWEEP PRINTED CIRCUIT
SET 331 FOLDER 7

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No	USE	TYPE	NOTES
V1	RF Amp.	6BQ7A	
V2	Mixer-Osc.	5BH8	
V3	1st Video-IF Amp.	3CB6	
V4	2nd Video-IF Amp.		
	Sound-IF Amp.	3CB6	
V5	3rd Video-IF Amp.	3CB6	
V6	Video Det., AGC Rect.	1AL5	
V7	Video Output Amp.	12BY7A	
V8	Limiter-Sync Sep.	5U8	
V9	Discriminator-IF Amp.	6T8	

ITEM No	USE	TYPE	NOTES
V10	Audio Output	5AQ5	
V11	Sync Amp.-Vert. Mult.	6CG7	
V12	Vert. Mult.-Vert. Output	5Y3GT	
V13	Horiz. AFC-Horiz. Osc.	6CG7	
V14	Horiz. Output	12DQ6	Note 2
V15	Damper	1A3/1G3T	
V16	HV Rectifier	1B3GT	
V17	LV Rectifier	5U4GB	

Note 1. 6BZ7 used in some versions
Note 2. 12CU6 used in some versions

PICTURE TUBE

ITEM No	REPLACEMENT DATA				NOTES
	CBS PART No.	CBS PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	
V18	21AL4-P4B ①	21AL4-P4B ①	21AL4-P4 A, B ①	21AL4-P4 A, B ①	① Aluminized ② Silver Screen "85"
		21AL4-P4A ①	21AL4-P4A ①		
		21AL4-P4 ①	21AL4-P4 ①		
	24DP4-A ①	24DP4-A ①	24DP4-A ①	24DP4-A ①	

ELECTROLYTIC CAPACITORS

ITEM No	RATING		REPLACEMENT DATA						NOTES
	CAP	VOLT	EMERSON PART No.	AEROVOX PART No.	CORNELL DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.	
C1A	80	300	925240	PRE-400	C154		TMC-120	Q-012	R2273 *	
B	40	350			BR1235		TD-10-250	FM-2512		
C	40	300								
D	10	150								
C1A	80	300	925241	EW 80-3	BO48	FP333 2	TMT-109	T-552	R2273 *	
B	40	300			BR8501					
C	100	50								

* Non-Catalog item

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No	RATING		REPLACEMENT DATA						NOTES
	CAP	VOLT	EMERSON PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	8.2			NPO-D18.2		ED18	NPOA-8R2			
C4	1000		941284							
C5	1000		941302							
C7	3			NPO-D3		ED3T	NPOA-030	ZT-353		
C8	1000		941284							
C9	5-3		940288		839-3		515-01-0R5	CT585A		
C10	1000		941284							
C11	60									
C12	5-3		940288		839-3		515-01-0R5	CT585A		
C13	5					TZ01	NPOA-0R5			
C14	8									
C15	10									
C16	1000			BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C17	1000			BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C18	1000		941284							
C19	1000		941284							
C20	1000		941284							
C21	1000		941284							
C22	1000		941284							
C23	1000		928933	BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C24	1000		928933	BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C25	1000		928933	BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C26	1000		928933	BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C27	1000		928933	BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C28	4700		928933	BPD-047	DD-472	KD79	811-0047	DC-5347	5GA-D47	
C29	3.9		928931	NT50-039	NT50-39	KD3	NPO0-390		5TC-Q39	
C30	1000		928933	BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C31	1	200	934315	P268K-1	DF-104	CUB3P2		PT402	3TM-P1	
C32	470		928907	BPD-047	DD-471	KD-47	811-471	DC5347	5GA-T47	
C33	100		928987	NT50-D100	TC2-100	ND3	NT50L-101	NT-531	5TC-T1	
C34	470		928995	NT50-D470	TC2-470	ND33	NT50K-470	NT-5447	5TC-Q47	
C35	4700		928923	BPD-047	DD-473	KD79	811-0047	DC-5347	5GA-D47	
C36	470		928907	BPD-047	DD-471	KD69	801-001	DC-5347	5GA-D47	
C37	1000		928933	BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C38	15			NT50-D15	TC2-15	ND21	NT50K-150		5TC-Q15	Note 1
C39	680		928909	BPD-068	DD-681	KD68	811-681	DC-5368	5GA-T68	
C37	33		928992	NT50-D33	TC2-33	ND24	NT50K-330		5TC-Q33	
C38	6800		928909	BPD-0068	DD-682	KD68	811-682	UC-5368	5GA-T68	
C39	4.7		928213	NP0-4E7	TCZ-4R7	Z010	NP0A-4R7	ZT-5547	5TCCB-V47	
C40	47		928995	NT50-D047	TC2-47	ND13	NT50K-470	NT-5447	5TC-Q47	
C41	1	200	934315	P268K-1	DF-104	CUB3P1		PT401	3TM-P1	
C42	047	400	934554	BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C43	1000		928933	BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C44	100		928918	NPO-D100	TCZ-100	NP0-101	101-101	ZT-531	5TCC-T1	
C45	4700		928923	BPD-0047	DD-472	KD79	811-0047	UC-5347	5BK-D47	
C46	4700		928923	BPD-0047	DD-473	KD79	811-0047	UC-5347	5BK-D47	
C47	100		928913	NPO-D100	TCZ-100	NP0-101	NP0-101-101	ZT-531	5TCC-T1	
C48	0.01	600	934553	BPD-001	DD-103	CUB6D1	GP31-103	PT631	6TM-D1	
C49	0047	600	934563	BPD-047	DD-472	CUB6D47	GP33-473	PT6347	6TM-D47	
C50	470		928918	BPD-0047	DD-471	KD69	801-001	DC-5347	5GA-T47	
C51	.01	400	934554	BPD-01	DF-503	CUB4S1	GP33-103	PT431	4TM-S1	
C52	.047	400	934555	BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C53	0047	600	934563	BPD-047	DE-472	CUB4D47	GP33-473	PT6247	5TM-D47	
C54	.01	400	934554	BPD-01	DE-503	CUB4S1	GP33-103	PT431	4TM-S1	
C55	.01	600	934564	BPD-01	DE-503	CUB4D1	GP31-103	UC-5332	5TM-T22	
C56	01	400	934554	BPD-01	DF-503	CUB4S1	GP33-103	PT431	4TM-S1	
C57	.001	600	934563	BPD-001	DE-503	CUB4D1	GP31-103	PT631	6TM-D1	
C58	0047	600	934563	BPD-047	DE-472	CUB4D47	GP33-473	PT6247	6TM-D47	
C59	0047	400	934554	BPD-047	DF-503	CUB4S47		PT4147	4TM-S47	
C60	.15	400	934431	P488K-15		CUB4P15		PT4015	4TM-P15	
C61	.1	600	934515	P488K-1	DF-104	CUB4P1		PT401	4TM-P1	
C62	.01	600	934554	BPD-01	DE-503	CUB4S1	GP33-103	PT631	6TM-S1	
C63	82	500	911380	1469-0008B2	DE-820	32BS0G82	801-820		MS-453	
C64	82	500	911380	1469-0008B2	DE-820	32BS0G82	801-820		MS-453	
C65	.047	400	934554	BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C66	.023	600	934564	BPD-01	DF-303	CUB4S23	H7-03	PT4723	4TM-S23	
C67	.047	400	934565	BPD-47		CUB3P47		PT4047	4TM-P47	
C68	.047	600	934564	BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C69	330	500	911387	1469-00033	D6-331	32BT33	811-331		MS-353	
C70	.01	600	934614							
C71	680	500	911388	1469-0008B		1BT83	811-681		MS-363	

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No	RATING		REPLACEMENT DATA						NOTES
	CAP	VOLT	EMERSON PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C72	.0047	400	934453	BPD-0047	DD-472	KD-47	811-0047	GP3-333-473	PT6247	6TM-D47
C73	01	200	934413	BPD-01	DD-103	CUB4S1	GP3-333-103	PT431	4TM-S1	
C74	.1	400	934514	P488M-1	DF-104	CUB4P1		PT401	4TM-P1	
C75	33	300	924335	P268M-33		CUB3P33		PT4033	3TM-P33	
C76	15	600	924715	P268M-15	DF-104	CUB4D1		PT601	6TM-V1	
C77	100	2000	928932	BPD-001	DD30-102	V3T1	3KV-101	DC30101	20GA-T1	
C78	1000		928933	BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C79	1000		928933	BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C80	1000		928933	BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C81	1000		928933	BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C82	1000		928933	BPD-001	DD-102	KD69	801-001	DC521	5BK-D1	
C83	10000	500	922301	BPD-01	DD-103	CUB6S1	811-01	PT631	6TM-S1	
C84	10000	500	922301	BPD-01	DD-103	CUB6S1	811-01	PT631	6TM-S1	
C85	1000	1500	928927	HVD-15-1000	DD30-102	MCD1	UR5KV-102	DC3021	20GA-D1	
C86	1000	1500	928927	HVD-15-1000	DD30-102	MCD1	UR5KV-102	DC3021	20GA-D1	

Note 1: Not used in some versions.

CONTROLS

ITEM No	RATING		REPLACEMENT DATA				INSTALLATION NOTES
	RESISTANCE	WATTS	EMERSON PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	600Ω	½	390407	F3-3	RTV-585	*QJ-1008	UF13R	Contrast (Panel) Note 1
B	1Meg	½		R2-53			UR18A ① †	Volume (Rear)
C	Switch			KS-1			UB-26	Attach to R1B
R2A	1Meg	½	390405	B-70	A47-1Meg-2	QJ3-137	U53	Tone Note 2
B	Shaft		Not Req.	Not Req.	F8-3	Not Req.	Not Req.	Attach to R2A
R3A	50K	½	390410	B-38	A47-50K-S	QJ1-123	U35	Horiz. Hold Note 3
B	Shaft		Not Req.	Not Req.	F8-3	Not Req.	Not Req.	Attach to R3A
R4A	1.5Meg	½	390409	AB-T42	A47-1.5Meg-S	QJ1-138	U165	Vert. Hold Note 3
B	Shaft		Not Req.	AK-3	F8-3	Not Req.	Not Req.	Attach to R4A
R5A	200K	½	390408	B-46	A47-200K-S	QJ1-129	U43	Brightness Note 4
B	Shaft		Not Req.	Not Req.	F8-3	Not Req.	Not Req.	Attach to R5A
R6	100K	½	390404					Picture Stabilizer
R7A	100K	½	392387	BX-40	A47-100K-S	QJ1-128	PTA151.	AGC
B	Shaft		Not Req.	Not Req.	RM-3	TQ	Not Req.	Attach to R7A
R8A	2Meg	½	390275	BX-75	A47-2Meg-S	QJ1-139	PTA261.	Vert Size
B	Shaft		Not Req.	Not Req.	RM-3	TQ	Not Req.	Attach to R8A
R9A	1500Ω	½	390343	AB-8	A47-1500-S	QJ1-109	PTA150L.	Vert. Linearity
B	Shaft		Not Req.	AK-19	RM-3	TQ	Not Req.	Attach to R9A
R10	50Ω	2	390350	39-50				Horiz. Centering-Wire-wound

Note 1: Versions 299 and 300 will use an alternate control part #390421.
Note 2: Versions 299 and 300 will use an alternate control part #390416.
Note 3: Versions 299 and 300 will use an alternate control part #390422.
Note 4: Versions 299 and 300 will use an alternate control part #390416.
† Universal Replacement (Mallory exact duplicate part no. UE45)
* Concentrikit Equivalent: K-6 Kit, Base elements & shafts; B17-105 & P17-105 (Panel)
B13-137 & R1-1B (Rear)
75-1 (Switch)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	EMERSON PART No.	IRC PART No.	
R11	680K			BTS-680K	
R12	47K			BTS-47K	
R13	2.2Meg			BTS-2.2Meg	
R14	220K			BTS-220K	
R15	10K			BTS-10K	
R16	10K				
R17	4700Ω			BTS-4700	
R18	6800Ω			BTS-6800	
R19	220K			BTS-220K	
R20	100K	1		BTA-100K	
R21	10K			BTS-10K	
R22	15K			BTS-15K	
R23	10000Ω			BTS-10000	
R24	470K		341123	BTS-470K	
R25	4.7Meg		383373	BTS-4.7Meg	
R26	15Ω		340053	BTS-15	
R27	470Ω		350413	BTS-470	
R28	68Ω		340373	BTS-68	
R29	27K		340823		
R30	470Ω		350413	BTS-470	
R31	15K		340773	BTS-15K	
R32	47Ω		340173	BTS-47	
R33	5600Ω		340673	BTS-5600	
R34	2200Ω		350573	BTS-2200	
R35	4700Ω		350653	BTS-4700	Note 1
R36	180Ω		340353	BTS-180	
R37	47K	1	370493	BTA-47K	
R38	100K		350473	BTS-100K	
R39	330K		340093	BTS-330K	
R40	1Meg		383233	BTS-1Meg	
R41	1Meg		383133	BTS-1Meg	
R42	15K		340773	BTS-15K	
R43	15K		340773	BTS-15K	
R44	4700Ω		340653	BTS-4700	
R45	470K		350133	BTS-470K	
R46	22K		340823	BTS-22K	
R47	4700Ω		340653	BTS-4700	
R48	10K	2	370733	BTH-10K	
R49	10K	2	380733	BTH-10K	
R50	10K	1	370733	BTA-10K	
R51	330K		350533	BTS-330K	
R52	10K		350733	BTS-10K	
R53	220K		350853	BTS-220K	
R54	470Ω		350453	BTS-470	
R55	40K		340723	BTS-40K	
R56	22K	1	370823	BTA-22K	
R57	100K		340973	BTS-100K	

ITEM No	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	EMERSON PART No.	IRC PART No.	
R58	10K		340973	BTS-100K	
R59	68K		340693	BTS-68K	
R60	10Meg		351453	BTS-10Meg	
R61	220K		350853	BTS-220K	
R62	470K		351133	BTS-470K	
R63	150000Ω	3	380323	BTS-1500	
R64	470Ω	1	370413	BTA-470	
R65	15K		350773	BTS-15K	
R66	470K		351133	BTS-470K	
R67	2.2Meg		351253	BTS-2.2Meg	
R68	22K		340823	BTS-22K	
R69	27K		340823	BTS-27K	
R70	1Meg		340433	BTS-1Meg	
R71	10K		340723	BTS-10K	
R72	22K		340823	BTS-22K	
R73	33K		340833	BTS-33K	
R74	33K		340833	BTS-33K	
R75	470K		351133	BTS-470K	
R76	1.5Meg		341353	BTS-1.5Meg	
R77	100K		340973	BTS-100K	
R78	2.2Meg		351253	BTS-2.2Meg	
R79	330Ω	1	380373	BTA-330	
R80	5600		340453		
R81	560Ω		340433		
R82	2200Ω		340573		
R83	2200Ω		340573		
R84	330K		340893	BTS-330K	
R85	330K		340893	BTS-330K	
R86	82K		340853		
R87	33000Ω		340633		
R88	180K		340813		
R89	150K		340773	BTS-150K	
R90	330K		340893	BTS-330K	
R91	6300Ω		340733		
R92	47K		340853	BTS-47K	
R93	150K		340813		
R94	68K		340693	BTS-68K	
R95	330K		341133		
R96	68Ω		330233		
R97	6300Ω	3	380713	BTH-6300	
R98	100Ω	2	380253		
R99	10K		340733		
R100	2000Ω	10	394139	PWH3-2000	
R101	470Ω	3	380453	BTH-470	
R102	43Ω	30	397106	BTH-43R	
R103	220K		352057	BTS-220K	
R104	330K		350393	BTS-330K	

Note 1: Some versions use a 10000 resistor in this application. (Part #350492).
Note 2: On some UHF-VHF versions a 3300 2W resistor is wired in parallel with R102; in other UHF-VHF versions a single 39Ω 20W 5% resistor is used in this application.

TRANSFORMER (POWER)

ITEM No	RATING			REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	EMERSON PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ 1.8A	530VCT @ 250mA	5V @ 3A		750080					

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No	USE	REPLACEMENT DATA							NOTES
		EMERSON PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	Horiz. Output Trans.	738119 ①	FB419P1 ③	HVO-36P ③	225T1*4 ③	XO94*8 ③	A-8255*3 ③	FLY-16*3 ③	D-50*8 ③	
		738123 ②								
T3	Vert. Output Trans.	738101	21900 ④	A-2823 ④		V307	A-8144 ④	36872	A-103X	
T4A	Yoke(90°)Horiz.(21MM)	708260	DF607 ⑤	MFD-93 ⑤	235D1 ⑤	T90P18/43 ⑤	DY-16A ⑤	Y-18 ⑤	Y-41-1 ⑤	
B	Vert. (40MM)									

① Used in chassis 180108, 180203.
② Used in chassis 180199, 180200.
③ Drill new mounting hole(s).
④ Use 8 to 1 turns ratio.
⑤ Use original yoke damping network.
‡ This part may be superceded by Parts Manufacturer's introduction of special unit for this application.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type is Listed

ORIGINAL TERMINAL (CONNECTIONS)	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
4	9	9	9	9	9	9	9
8	5	5	5	4	5	5	5
7	5	5	5	5	5	5	5
2	N.C. See Note ②	N.C. See Note ②	N.C. See Note ②	N.C. See Note ②	N.C. See Note ②	N.C. See Note ②	N.C. See Note ②
5	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
Special Notes	③ ⑤	③ ⑤	③ ⑤	③ ⑤	③ ⑤	③ ⑤	③ ⑤

② Install new damping network, consisting of approximately 56MMF @ 2KV, and 10000Ω, 1W. Connect in series across horiz. yoke terms. #3 and #7.
③ If necessary to increase width, add capacity (Approx. 50-100MMF @ 6KV (Minimum)) across horiz. yoke terms. #3 and #1.

TRANSFORMER (AUDIO OUTPUT)

ITEM No	IMPEDANCE		REPLACEMENT DATA					NOTES
	PRI.	SEC.	EMERSON PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T5	4.7KΩ	3-4Ω	734125	22000 ①	A-2230 ①	A-3850 ①	24851 ①	S-52 ①	① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	EMERSON PART No.	QUAM PART No.	RCA TYPE No.	
SP1	6"	PM	3-4Ω	180141 ①	8A1	23881	① Used in models 1178, 1177, 1178, 1179, 1180. ② Used in models 1180, 1181, 1182.
	8"	PM		180141 ②			

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	EMERSON PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	4th Video Trap	0Ω		730154				Includes 41.25mc trap.
L2	1st Video IF	1Ω		730201				
L3	2nd Video IF	.1Ω	.1Ω	730198	17-4634		6316	
L4	RF Choke	L.3Ω		709033	19-1001		4004	L.5 Microhenries, IRC Part #CLA
L5A	3rd Video IF	.1Ω	.1Ω	730226				
B	2nd Video IF	.1Ω						
L6	RF Choke	.31Ω		709035				.98 Microhenry, IRC Part #CLA
L7	4th Video IF	.1Ω	.1Ω	730198	17-4633	TV-130	6315	
L8	Series Peaking Coil	L.2Ω		709308	19-1003		4008	4.6 Microhenries.
L9	1st Video IF	7.8Ω	L.3Ω	730178				
L10	Series Peaking Coil	5.3Ω		709324	19-1004		4010	6.8 Microhenries, IRC Part #CLA
L11	Shunt Peaking Coil	15Ω		709373	19-4400		6126	440 Microhenries.
L12	Shunt Peaking Coil	9.3Ω		709373	19-3300	TV-120	6122	330 Microhenries.
L13	Shunt Peaking Coil	14Ω		709314	19-4400		6126	440 Microhenries.
L14	RF Choke	L.7Ω		709371	19-1003		4008	4.6 Microhenries.
L15	RF Choke	4Ω	4Ω	709376	19-4400		6126	
L16	RF Choke	8.3Ω		709031	19-1006		4013	10 Microhenries, IRC Part #CL-1

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES.		REPLACEMENT DATA						NOTES
	PRI.	SEC.	EMERSON PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	RCA TYPE No.	Ram PART No.	Thordarson PART No.
L17	130Ω		716103						Horiz osc. tapped @ 85Ω Horiz. waveform
L18	29Ω		709375						

FILTER CHOKE

ITEM No.	RATINGS		REPLACEMENT DATA						
	TOTAL DIRECT CURRENT	D.C. RESISTANCE	INDUCTANCE (0 CURRENT (000 ^)	EMERSON PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L19	180A	25Ω	.52H†	737023			C-2328 ①		

① Drill one new mounting hole.

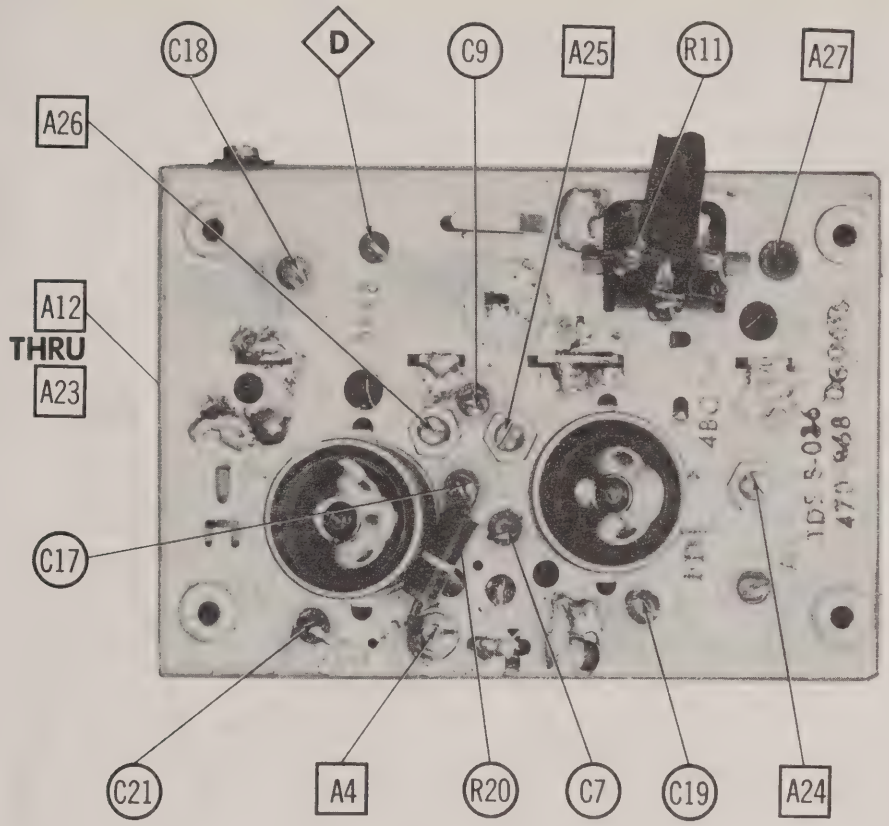
PARTS LIST AND DESCRIPTIONS (Continued)

FUSES

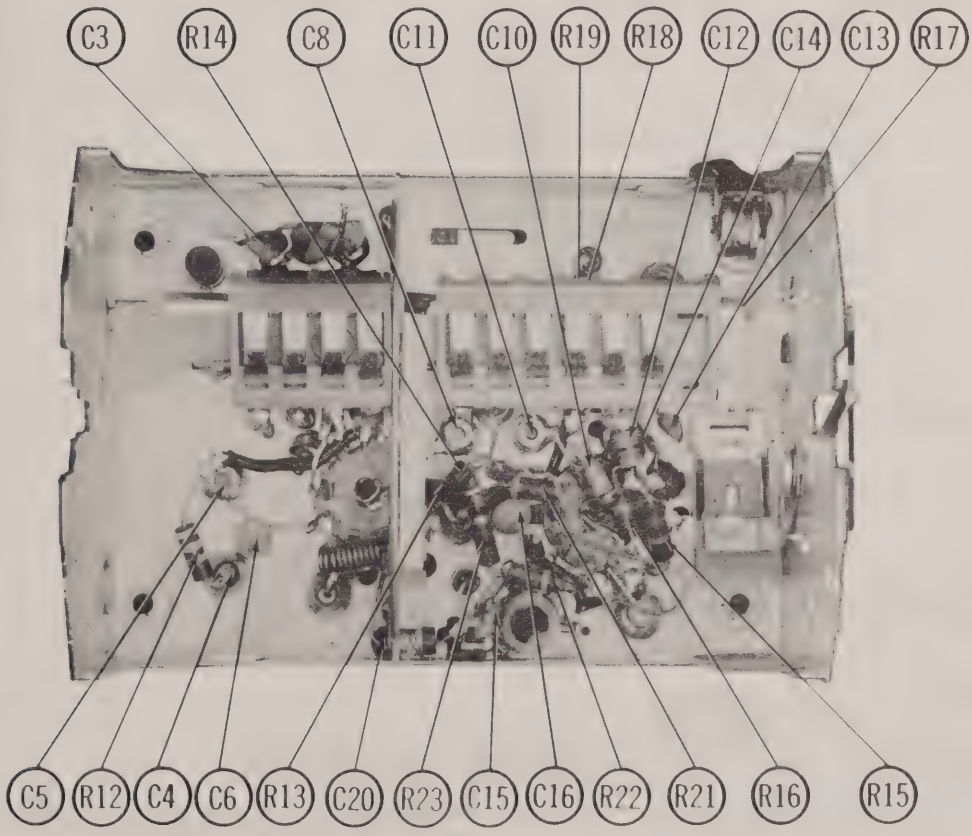
ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			EMERSON PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	N	2 1/2A 250V	808015		33302.5 (N 2 1/2 A)	346017	N 2 1/2	HN1 3/4 - 2 1/2

MISCELLANEOUS

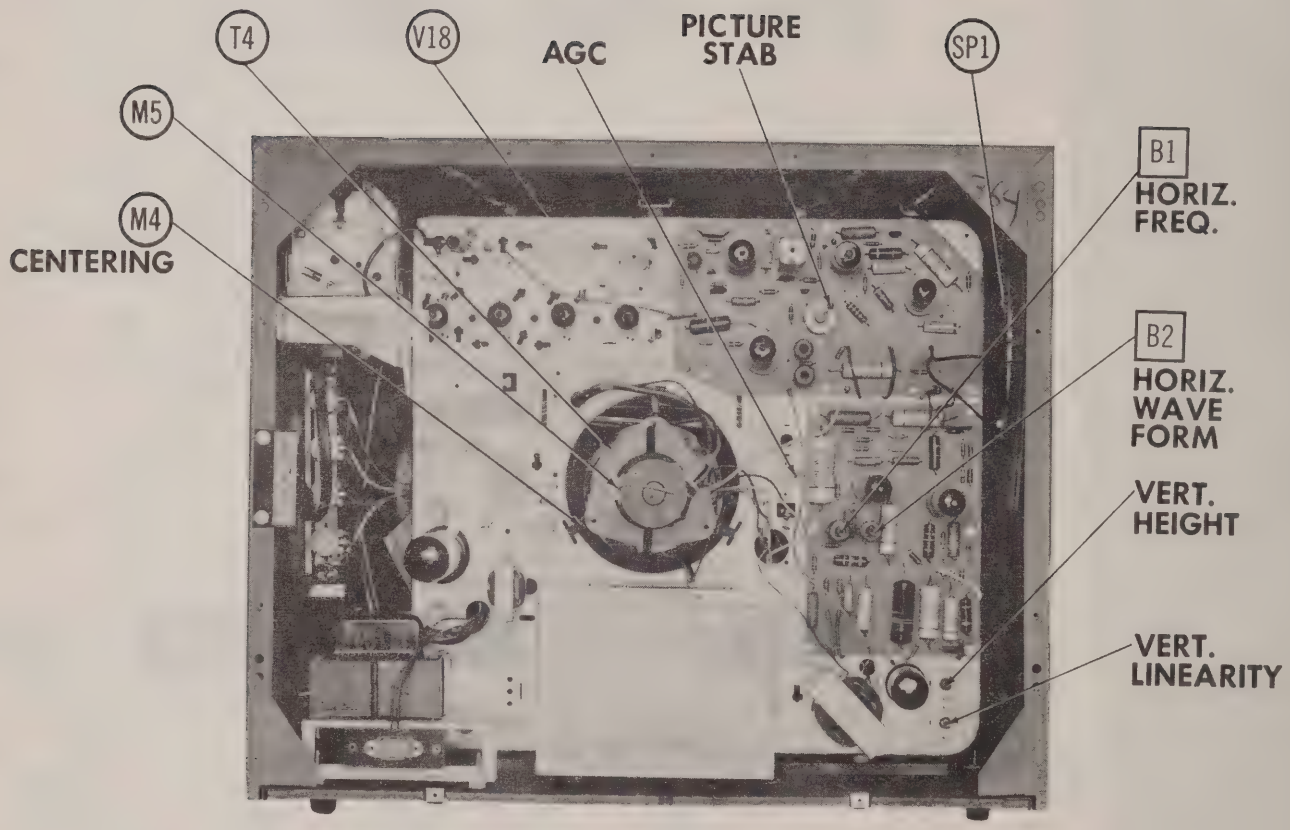
ITEM No.	PART NAME	EMERSON PART No.	NOTES
M2	Tuner	470868	VHF - Chassis 120292-V.
	Tuner	470889	VHF - Chassis 120299-V.
	Tuner	470869	VHF - Chassis 120292-P.
M3	Tuner	470870	(VHF-UHF) Chassis 120293-T.
	Tuner	470876	(VHF-UHF) Chassis 120293-X.
	Tuner	470892	(VHF-UHF) Chassis 120300-X.
M4	Centering device	708277	
M5	Ion Trap	708129	
	Cabinet	140749	Model 1176
	Cabinet	140749A	Model 1177
	Cabinet	140789	Model 1178
	Cabinet	140789A	Model 1179
	Cabinet	140748	Model 1180
	Cabinet	140748A	Model 1181
	Cabinet	140750	Model 1186
	Cabinet	140750A	Model 1187
	Cabinet	140754	Model 1188
	Cabinet	140754A	Model 1189
	Knob	460713	Vert. Hold, Horiz. Hold, Brightness, Tone Models 1176, 1177, 1178, 1179, 1180, 1181
	Knob	450227	Channel Selector - Models 1176, 1178, 1180.
	Knob	450228	(On-Off-Volume) Models 1176, 1178, 1180
	Knob	460233A	Contrast - Models 1176, 1178, 1180
	Knob	460234A	Fine Tuning - Models 1176, 1178, 1180
	Knob	460690A	VHF Channel Selector - Models 1177, 1179, 1181 (Chassis 120293-T)
	Knob	460691A	UHF Channel Selector - Models 1177, 1179, 1181, (Chassis 120293-T)
	Knob	460692	Fine Tuning - Models 1177, 1179, 1181 (Chassis 120293-T)
	Knob	460693A	(On-Off-Volume) Models 1177, 1179, 1181 (Chassis 120293-T)
	Knob	460694A	Contrast - Models 1177, 1179, 1181 (Chassis 120293-T)
	Knob	450236B	VHF Channel Selector - Models 1177, 1179, 1181 (Chassis 120293-X)
	Knob	460685	UHF Channel Selector - Models 1177, 1179, 1181 (Chassis 120293-X)
	Knob	450235B	Small (On-Off-Volume) Models 1177, 1179, 1181 (Chassis 120293-X)
	Knob	460669B	Skirt (On-Off-Volume) Models 1177, 1179, 1181 (Chassis 120293-X)
	Knob	460671B	Large (Contrast) Models 1177, 1179, 1181
	Knob	460684	UHF Dial - Models 1177, 1179, 1181, 1187, 1189
	Knob	460672B	Large (Tuning) Models 1177, 1179, 1181, 1186, 1187 1188, 1189
	Knob	450233	On-Off-Volume & Horiz. Hold - Models 1186, 1187, 1188, 1189.
	Knob	450234	Tone & Brightness - Models 1186, 1187, 1188, 1189
	Knob	450229	Contrast & Vert. Hold - Models 1186, 1187, 1188, 1189
	Knob	450236C	VHF Channel Selector - Models 1186, 1187, 1188, 1189
	Knob	460685A	UHF Channel Selector - Models 1187, 1189
	Mask	460731	Models 1176, 1177, 1178, 1179, 1180, 1181
	Mask	460730	Models 1186, 1187
	Mask	460688C	Models 1188, 1189
	Safety Glass	520243	Models 1176, 1177, 1178, 1179, 1180, 1181
	Safety Glass	520232	Models 1186, 1187, 1188, 1189.



RF TUNER-TOP VIEW



RF TUNER-BOTTOM VIEW



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern. Set the picture stabilizer control (R6) fully clockwise.

Alignment of the horizontal oscillator can be done without removing chassis.

1. Turn the horizontal hold control maximum clockwise position.

2. Connect short across L18. Leads are brought to terminal strip on top of chassis (near the rear center) for shorting out L18.

3. Adjust the horizontal frequency slug (B1) to the center of the range over which the picture synchronizes horizontally.

4. Remove short from L18.

5. Connect the vertical input lead of an oscilloscope to point Ⓔ. Low side to chassis.

6. Adjust the horizontal waveform slug (B2) until the broad and narrow peaks are of equal amplitude as shown in Fig. 6.

7. Remove scope from point Ⓔ and chassis. The picture should be in sync and remain in synchronization over the entire range of the horizontal hold control. Adjust the horizontal width sleeve (slide in or out of yoke) for a picture slightly wider than necessary to fill the picture mask horizontally.

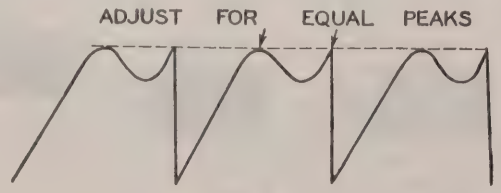
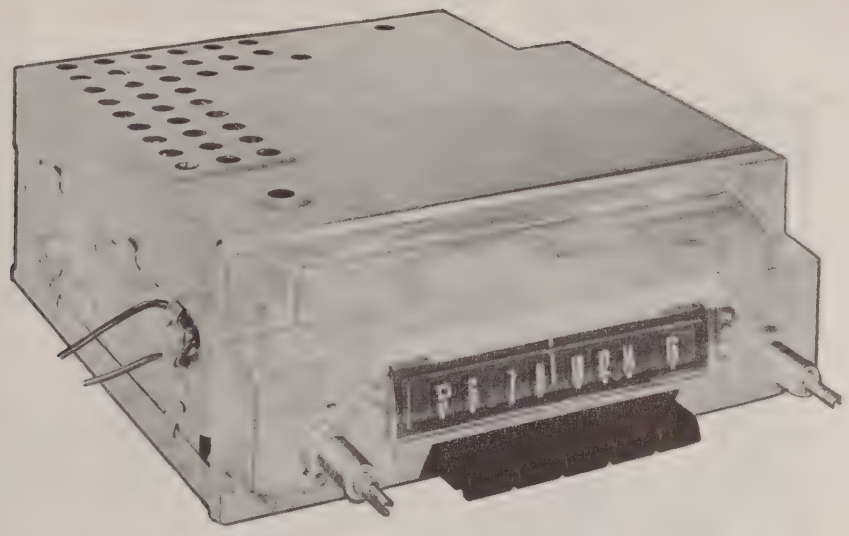


FIG. 6



TRADE NAME	Ford Model 6BF (FDR-18805-B) (For 1956 Ford Automobiles)
MANUFACTURER	Bendix Radio, Div. of Bendix Aviation Corp., Baltimore, Maryland
TYPE SET	Battery Operated Custom Built AM Superheterodyne Automobile Receiver
TUBES (Six)	Types 12BA6 RF Amplifier, 12BE6 Converter, 12AU6 IF Amplifier, 12AV6 Det-AVC-AF Amp., 12AQ5 Output, 12X4 Rectifier
POWER SUPPLY	12 Volt Storage Battery
TUNING RANGE—BROADCAST	540KC - 1600KC RATING 2.8 Amp. @ 12.6 Volts DC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	Fig. 1	Thru dummy to antenna receptacle.	262KC (400% Mod)	650KC	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output.
2.	"	"	1605KC	High frequency end of dial.	"	A5, A6, A7	"
3.	With radio installed in car and antenna fully extended, tune in a weak station near 1600KC, and adjust A7 for maximum volume.						
	The following steps are necessary only in case of core or tuning coil replacement.						
4.				High frequency end of dial.	Across voice coil.	A8, A9, A10	Adjust tuner cores so that they remain in coil forms but out of coils.
5.	Fig. 1	Thru dummy to antenna receptacle.	1605KC	"	"	A5, A6, A7	Adjust for maximum output in order given.
6.	"	"	1200KC	1200KC	"	A10, A9, A8	"
7.	"	"	1605KC	High frequency end of dial.	"	A5, A6, A7	Adjust for maximum output in order given. Repeat steps 6 & 7 but adjust A8, A9 & A10 at 1200KC only.

PUSH BUTTON ADJUSTMENT

Pull push button all the way out. Tune manually to desired station. Press push button in firmly. Repeat on remaining push buttons.

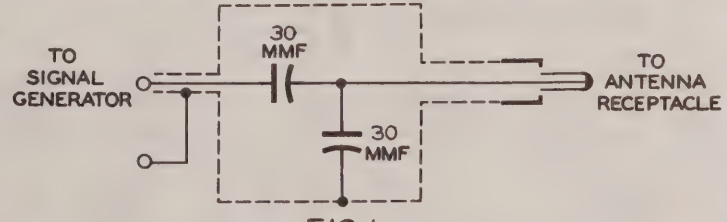


FIG. 1

"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed." "Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1956 by Howard W. Sams & Co., Inc., Indianapolis 5, Indiana, U. S. of America. Copyright under international Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America

FORD MODEL
6BF (Ch. FDR-18805-B)

FORD MODEL
6BF (Ch. FDR-18805-B)

PARTS LIST AND DESCRIPTIONS

FORD
MODEL 6BF (FDR-18805-B)

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amplifier	12BA6	
V2	Converter	12BE6	
V3	IF Amplifier	12AU6	
V4	Det-AVC-AF Amp.	12AV6	
V5	Output	12AQ5	
V6	Rectifier	12X4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA BENDIX PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■20	350		AFH3-106	C096	FP345.8	TMT-91	T-465	TVL-3634
B	▲10	300							
C	20	25							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA BENDIX PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	180			NP0-SI180	D6-181	22R5T18	811-181		MS-318	
C3	100			SIUU	D6-101	TP34	GP1K-101	UC-531	5GA-T1	
C4	.1	200		P288N-1	DF-104	CUB2P1		PT401	2TM-P1	
C5	.1	400		P488N-1	DF-104	CUB4P1		PT401	4TM-P1	
C6	8.2			NP0-SI8.2		2016	NP0A-8R2			
C7	51				TCN-51	N035	N750K-510		5TCU-Q5	
C8	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C9	15000			BPD-015	DD16-153		821-015		5HK-S15	
C10	3600			BPD-004	D6-402	K078	811-004	UC-5240	5GA-D39	
C11	330			SI330	D6-331	TP43	GP2K-331	UC-5333	5GA-T33	
C12	.015	200		BPD-015	DD16-153	CUB6S15	821-015	PT6115	4TM-S15	
C13	.008	1600		P1688N-008	DD16-802	CUB16D8		PT1628	16TM-D8	
C14	.5	100		VHC36		ST2P5		RF480	68P20	

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA. BENDIX PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	2Meg	½	L219681-1				UE1780S	Tone (Panel)
B	500K	½						Volume & Switch (Rear) -- Tapped@ 150K
R2	3000Ω	2						Sensitivity (Wire wound)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

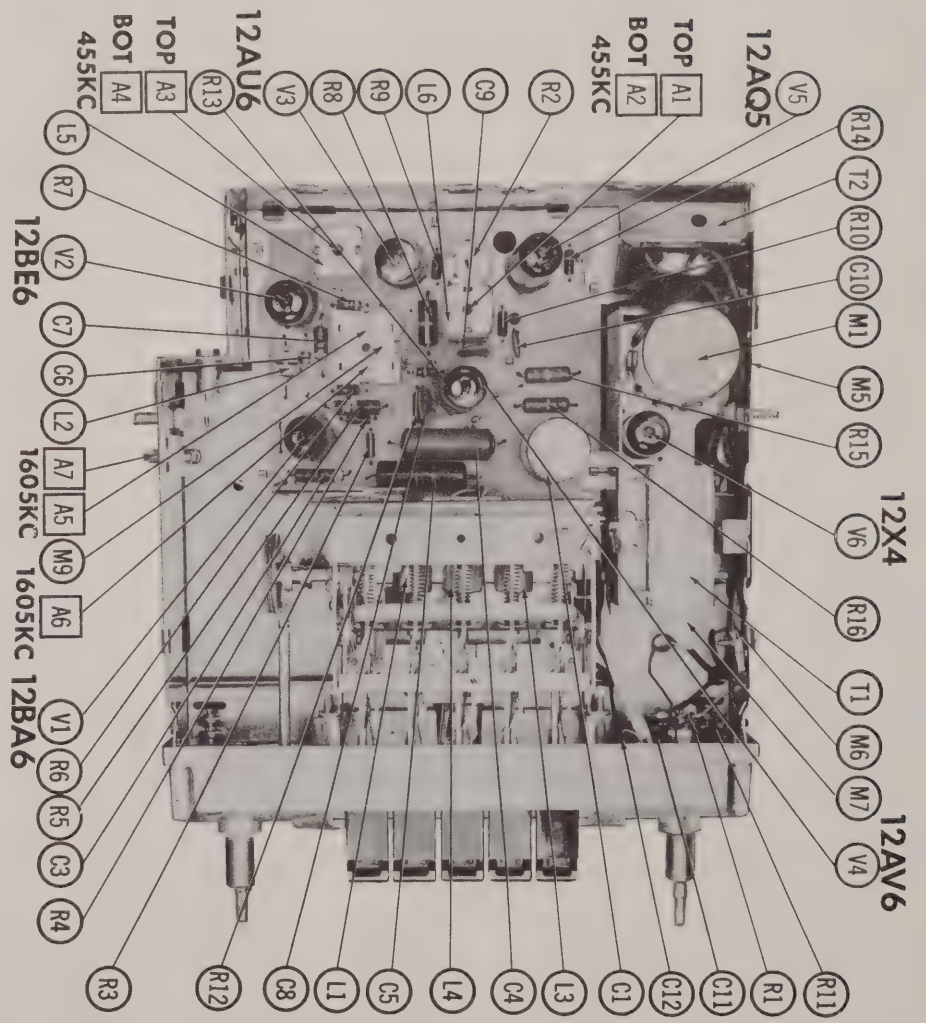
ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA BENDIX PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R3	1Meg			BTS-1Meg	
R4	22Meg			BTS-22Meg	
R5	10K	1		BTA-10K	
R6	68Ω			BTS-68	
R7	47K			BTS-47K	
R8	22K	2		BTB-22K	
R9	220Ω			BTS-220	
R10	1.5Meg			BTS-L 5Meg	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA BENDIX PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R11	22K			BTS-22K	
R12	10Meg			BTS-10Meg	
R13	470K			BTS-470K	
R14	150K			BTS-150K	
R15	270Ω	1		BTA-270	
R16	1000Ω	1		BTA-1000	
R17	180Ω	1		BTA-180	
R18	180Ω	1		BTA-180	

TRANSFORMER (VIBRATOR)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	REPLACEMENT DATA BENDIX PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	12.6VCT @1.75A	520VCT @.053A			L-291818-1	V3903	P-2861	P-6489	22R52	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	BENDIX PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	6. 2K	3-4Ω	L291824-1	Z1004	A-2931	A-3850	24S60	S-7X	

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	BENDIX PART No.	QUAM PART No.	RCA TYPE No.	
SP1	6" X 9"	PM	3-4Ω	L222081-1	69A2	238S1	

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	BENDIX PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Coil	13Ω						Part of tuner, M4.
L2	RF Choke	6Ω						Wound on 18K resistor.
L3	RF Coil	6. 8Ω						Part of tuner, M4.
L4	Osc. Coil	. 5Ω	2. 7Ω					Part of tuner, M4.
L5	Input IF	53Ω	48Ω	L291791-1				
L6	Output IF	44Ω	44Ω	L291820-1				
L7	Fil. Choke	1Ω						
L8	Vib. Hash Choke	. 1Ω						

VIBRATOR

ITEM No.	TYPE	INPUT VOLTS	FRE-QUENCY	REPLACEMENT DATA				NOTES
				BENDIX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	RADIART PART No.	
M1	Interrupter	12. 6V	115∿	C-221139-1	6330	G883	6330	

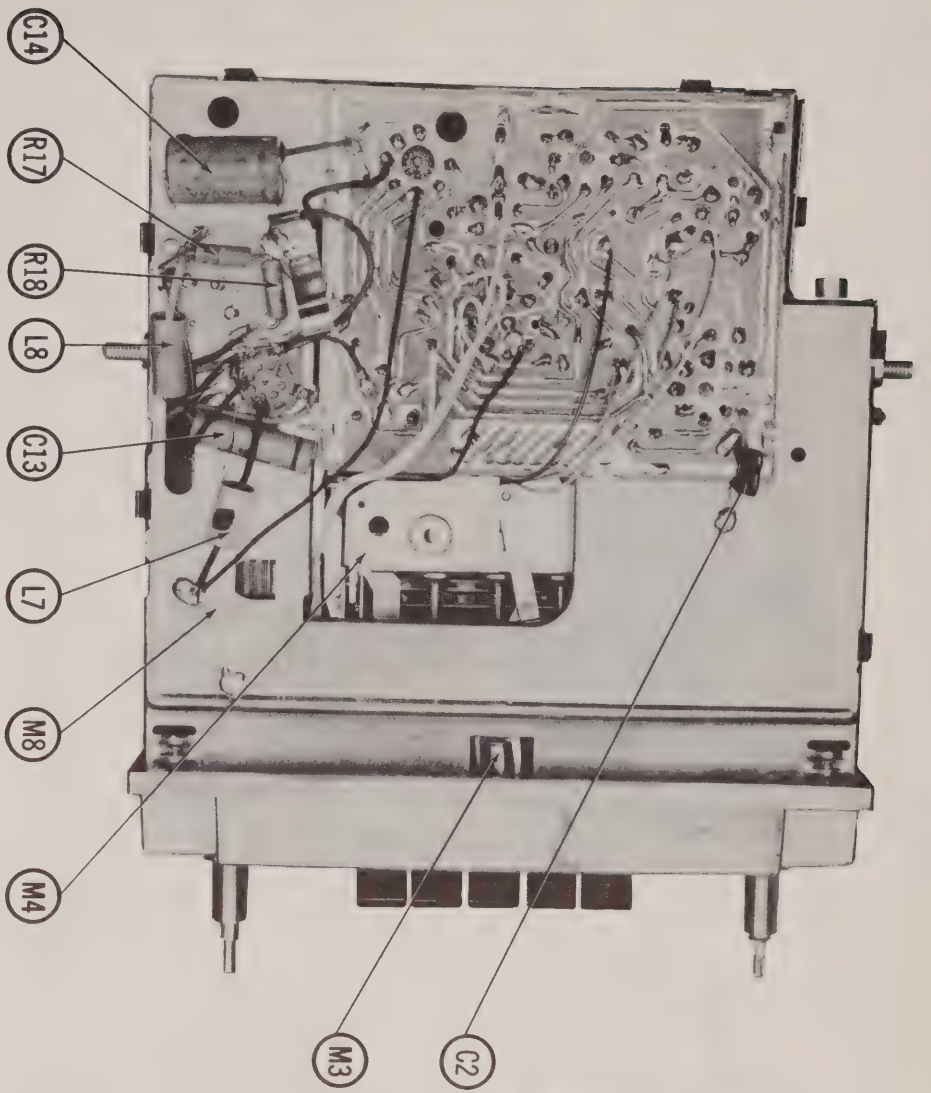
FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			BENDIX PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	1AG	5A 32V			301005, (1AG 5A)	155004	AGA5	HRF

MISCELLANEOUS

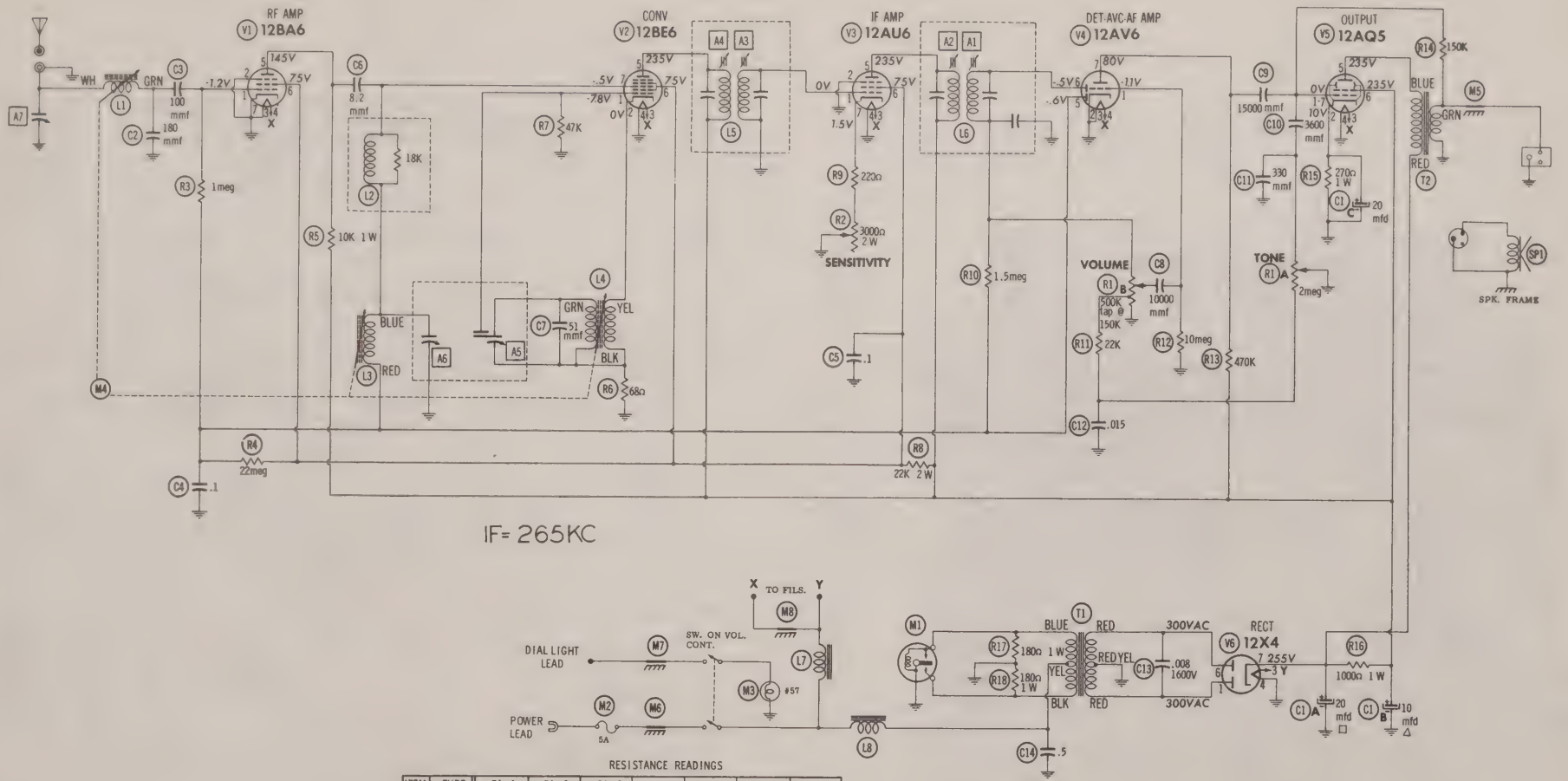
ITEM No.	PART NAME	BENDIX PART No.	NOTES
M3	Dial Light		#57
M4	Tuner	221461-1	Permeability; Includes L1, L3, L4.
M5	Spark Plate		Speaker
M6	Spark Plate		Power Input Lead
M7	Spark Plate		Dial Light Lead
M8	Spark Plate		Filament
M9	Trimmer Cap.	L219092-1	Dual; Osc. A5 (370-445MM), RF A6 (120-450MMF). Unit also includes 100MMF fixed capacitor.
A7	Trimmer Cap.	C219083-1	Ant. (4-75MMF)

CHASSIS—BOTTOM VIEW



DENVER, COLORADO
L. F. RADIO CORP.

FORD MODEL 6BF (FDR-18805-B)



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12BA6	3Meg	0Ω	0Ω	1.5Ω	†11K	†23K	0Ω
V2	12BE6	47K	68Ω	1.5Ω	0Ω	†1000Ω	†23K	2Meg
V3	12AU6	44Ω	0Ω	1.5Ω	0Ω	†1000Ω	†23K	700Ω
V4	12AV6	10Meg	0Ω	0Ω	1.5Ω	2Meg	500K	†470K
V5	12AQ5	150K	270Ω	1.5Ω	0Ω	†650Ω	†1000Ω	150K
V6	12X4	290Ω	NC	1.5Ω	0Ω	TP	315Ω	15K

† MEASURED FROM PIN 7 OF V6.
NC NO CONNECTION
TP TIE POINT

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Battery voltage maintained at 12.6 volts for voltage readings.
5. Nominal tolerance on components values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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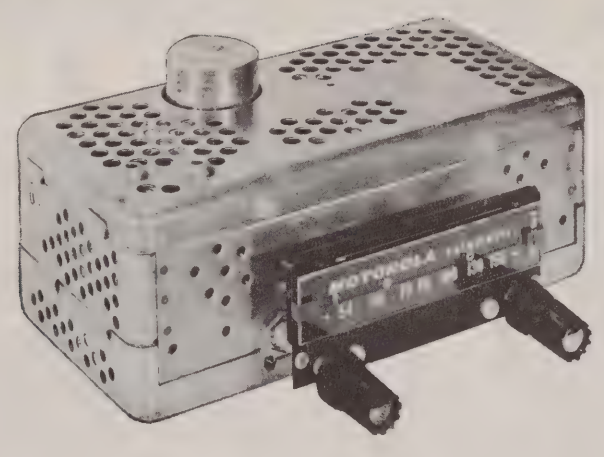


PROPERTY OF
L. F. BANKENSHIP

MOTOROLA
MODELS 6M, 6M-12

TRADE NAME	Motorola Models 6M (6 Volt), 6M-12 (12 Volt)
MANUFACTURER	Motorola Inc., 4545 W. Augusta Blvd., Chicago 51, Illinois
TYPE SET	Battery Operated Universal Type AM Superheterodyne Automobile Receiver
TUBES (Six)	Types 12BD6 RF Amplifier, 12BE6 Converter, 12BD6 IF Amplifier, 12CR6 Det.-AVC-AF Amp., 12AQ5 Output, 12X4 Rectifier (Equivalent 6 Volt Tubes used in Model 6M)
POWER SUPPLY	12 Volt Storage Battery (Model 6M-12) RATING 2.8 Amp. @ 12.6 Volts DC
TUNING RANGE—BROADCAST	540KC-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
* Not necessary, except in case of tampering or replacement of tuning cores or components.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (grid) of 12BE6 (V2). Low side to chassis.	455KC	High frequency end stop.	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.	Fig. 1	Thru dummy to antenna receptacle.	1610KC	"	"	A5, A6 A7	"
*3.	"	"	"	"	"	"	Using alignment tool (Fig. 2) back A8, A9, A10 (tuning cores) out of coils, but not out of coil forms. Adjust A5, A6, A7 for maximum output.
*4.	"	"	1400KC	Adjust 13/64" from high freq. end stop.	"	A8, A9, A10	Using alignment tool (Fig. 2) adjust A8, A9, A10 for maximum output.
*5.	"	"	1610KC	High freq. end stop.	"	A5, A6, A7	Retouch for maximum output.

With radio installed in car and antenna fully extended, tune in a weak station near 1400KC and adjust A7 for maximum volume.

POINTER REPLACEMENT OR ADJUSTMENT

Set tuner to high frequency end stop. Place pointer to coincide with dot at extreme right end of dial. Cement pointer in place.

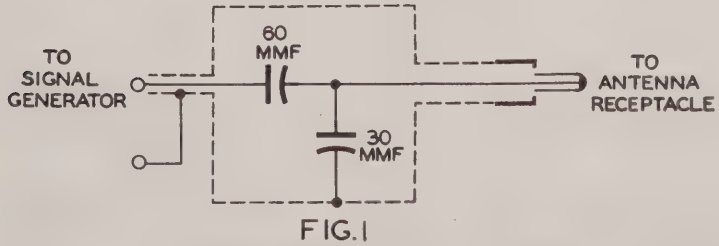


FIG. 1

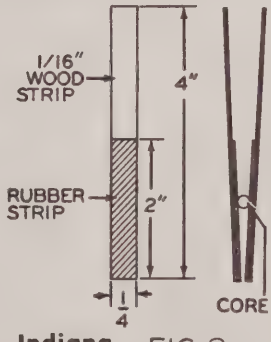


FIG. 2

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed." "Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1956 by Howard W. Sams & Co., Inc., Indianapolis 5, Indiana, U. S. of America. Copyright under international Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America

PARTS LIST AND DESCRIPTIONS

MOTOROLA MODEL 6M

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amplifier	12BD6	Note 1
V2	Converter	12BE6	Note 1
V3	IF Amplifier	12BD6	Note 1
V4	Det.-AVC-AF Amplifier	12CR6	Note 1
V5	Output	12AQ5	Note 1
V6	Rectifier	12X4	Note 1

Note 1. Equivalent 6 volt tubes used in Model 6M.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA MOTOROLA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■15	350	23A485677	AFH3-104	C077	FP328	TMT-89	T-455	R2274 *
B	▲10	350							
C	20	25							

* Non-catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA MOTOROLA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	90		21K533453							
C3	150		21R410112	BPD-00015	DD-151	G046	811-151	UC-5315	5GA-T15	
C4	4.7		21R115955	NP0-SI4.7	TCZ-4R7	TZ07	NP0A-4R7	ZT-5547	5TCCB-V47	
C5	47		21R115593	N750-DI47	TCN-47	N033	N750K-470	NT-5447	5TCU-Q47	
C6	.05	400	8R121567	BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C7	.05	200	8R121005	BPD-05	DF-503	CUB2S5		PT415	2TM-S5	
C8	10000		21R482726	BPD-01	D6-103	K082	811-01	DC-511	5HK-S1	
C9	.1	400	8R121006	P488N-1	DF-104	CUB4P1		PT401	4TM-P1	
C10	.002	600	8R121568	BPD-002	D6-202	CUB6D2	GP2-333-202	PT622	6TM-D2	
C11	.02	200	8R121003	BPD-02	DF-203	CUB4S2	817-02	PT412	2TM-S2	
C12	.01	400	8R121002	BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C13	470		21R410121	BPD-00047	DD-471	K060	811-471	UC-5347	5GA-T47	
C14	.004	600	8R121000	BPD-004	D6-402	CUB6D4	GP2-333-402	PT624	6TM-D4	
C15A	300		21A522033							
B	300									
C16	.04	1000	8A121549	P1088N-04		CUB16S4		PT1614	10TM-S4	Note 1
C17	.5	100	8K122076	VHC36		ST2P5		RF480	68P20	
C18	.5	100	8K122076	VHC36		ST2P5		RF480	68P20	

Note 1. Model 6M uses .02MFD in this application (part #8R121004).

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA MOTOROLA PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	‡	18K533457	F1-55		*QJ-800A		Tone (Panel)
B	250K	‡		R4-37				Volume (Rear) Tapped @ 125K
C	Switch			KB-4				Attach to R1B

* Concentrikit Equivalent: K-6 Kit, Base Elements & Shafts: B11-137 & P17-129 (Panel)
B13-130X & R9-214 (Rear)
76-1 Switch

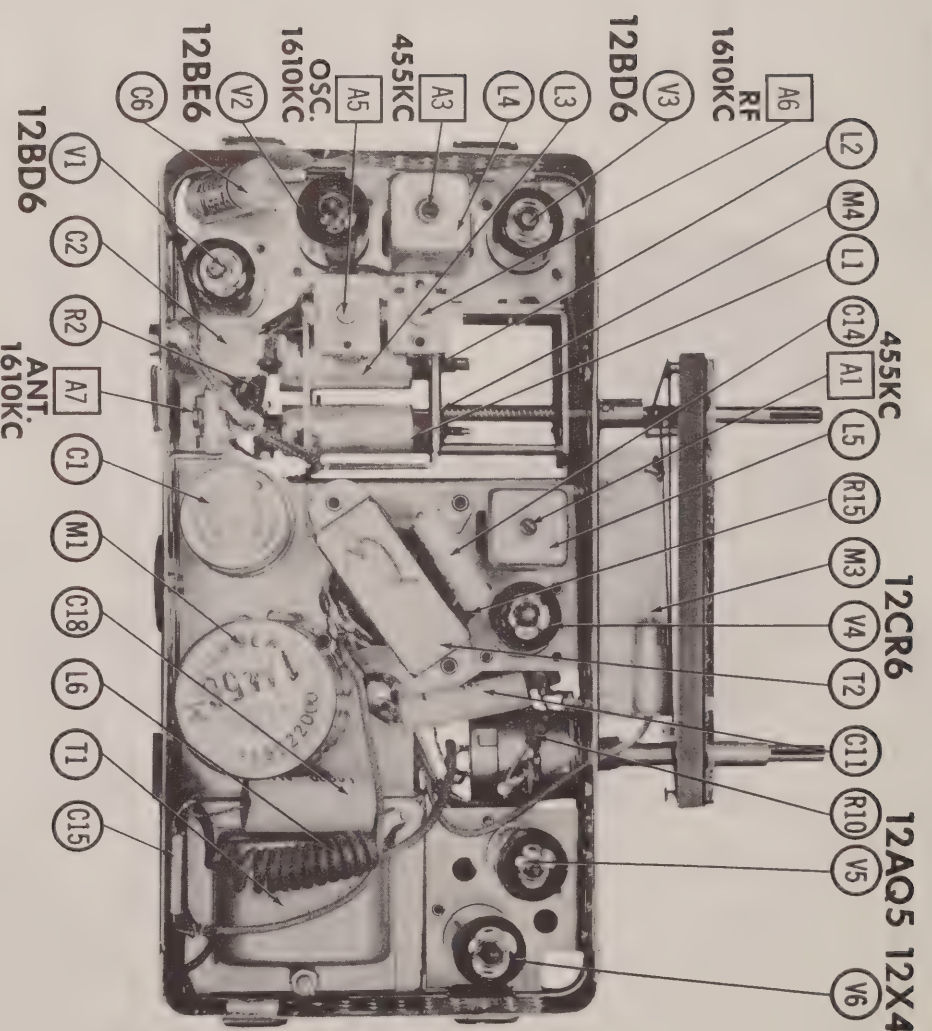
RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA MOTOROLA PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R2	100K		6R6075	BTS-100K	
R3	1Meg		6R6004	BTS-1Meg	
R4	220Ω			BTS-220	Note 1
R5	100K		6R6075	BTS-100K	
R6	47K		6R6056	BTS-47K	
R7	6800Ω	2	6R5690	BTB-6800	
R8	150Ω		6R6373	BTS-150	Note 2
R9	3.3Meg		6R2118	BTS-3.3Meg	
R10	15K		6R2119	BTS-15K	
R11	2.2Meg		6R3927	BTS-2.2Meg	
R12	1Meg		6R6004	BTS-1Meg	
R13	220K		6R6015	BTS-220K	
R14	270K		6R6414	BTS-270K	
R15	4.7Meg		6R2122	BTS-4.7Meg	
R16	270Ω		6R6432	BTS-270	
R17	2200Ω	2	6R476130	BTB-2200	
R18	220Ω	1	6R6389	BTA-220	Note 3
R19	220Ω	1	6R6389	BTA-220	Note 3

Note 1. Some versions use 150Ω in this application. (Part #6R6373).
Note 2. Some versions use 390Ω in this application (part #6R5554).
Note 3. The 6 volt models use 56Ω 1W in this application (part #6R2037).

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (VIBRATOR)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	12.6VCT @1.4A	470VCT @.053A			25C534979A ①					

① Part #25C534978 used in Model 6M.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	5.2KΩ	3-4Ω	25B70171-P	Z1107	A-2930	A-3877	24S51	S-3X	

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	MOTOROLA PART No.	QUAM PART No.	RCA TYPE No.	
SP1	6"x 9"	PM	3-4Ω	50C533088	69A3	23881	

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	MOTOROLA PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Coil	13Ω						Note 1
L2	RF Coil	13Ω						Note 2
L3	Osc. Coil	.5Ω	2.3Ω					Note 3
L4	Input IF	18Ω	18Ω	24K533461	16-6758	BC-352	12-C1	
L5	Output IF	18Ω	18Ω	24B533460	16-6770	BC-355	12-C6	
L6	Fil. Choke	0Ω		24K533822				1.1 Microhenries
L7	Vib. Hash Choke	0Ω		24A534494				21.2 Microhenries, Note 4

Note 1. Part #1K536807 used in tuner #77D536804 (MT-177).
Part #24B536919 used in tuner #77D536917 (MT-178).
Note 2. Part #1K536806 used in tuner #77D536804 (MT-177).
Part #24K536585 used in tuner #77D536917 (MT-178).
Note 3. Part #1K536805 used in tuner #77D536804 (MT-177).
Part #24B536594 used in tuner #77D536917 (MT-178).
Note 4. Alternate part #24A532093 used in Model 6M.

VIBRATOR

ITEM No.	TYPE	INPUT VOLTS	FREQUENCY	REPLACEMENT DATA				NOTES
				MOTOROLA PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	RADIART PART No.	
M1	Interrupter	12.6V	115∿	48B522000	6301	G859	6301	
M1	Interrupter	6V	115∿	48B3333	5342	903M	5342	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			MOTOROLA PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	SFE	5A ①	65R122345	9C536545	301005. (1AG 5A)	155004	AGA5	HRF
M2		9A ②	65R16248	9K536617	307009. (SFE9)	155009	SFE9	HRH

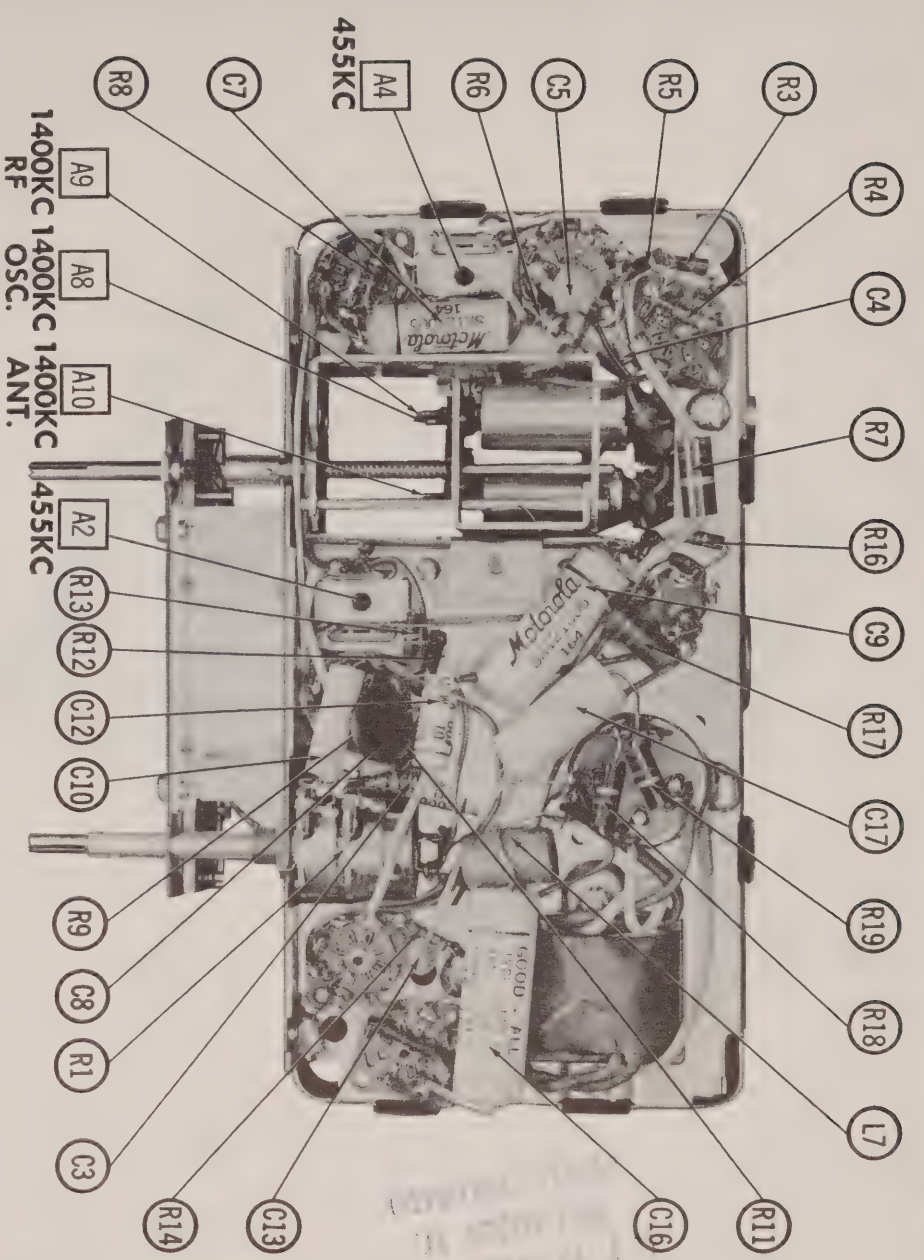
① Model 6M-12.
② Model 6M.

MISCELLANEOUS

ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
M3	Dial Light	65T533821	#1891, Model 6M-12
	Dial Light	65X10867	#44, Model 6M
M4	Tuner	77D536804 *	(MT-177), Permeability (complete) Includes L1, L2, L3
A5	Trimmer Cap.	20A485708	Osc. (395-470MMF)
A6	Trimmer Cap.	20A481526	RF (20-180MMF)
A7	Trimmer Cap.	20A502338	Ant. (50-280MMF)

* Alternate tuner, part #77D536917 (MT-178).

CHASSIS—BOTTOM VIEW



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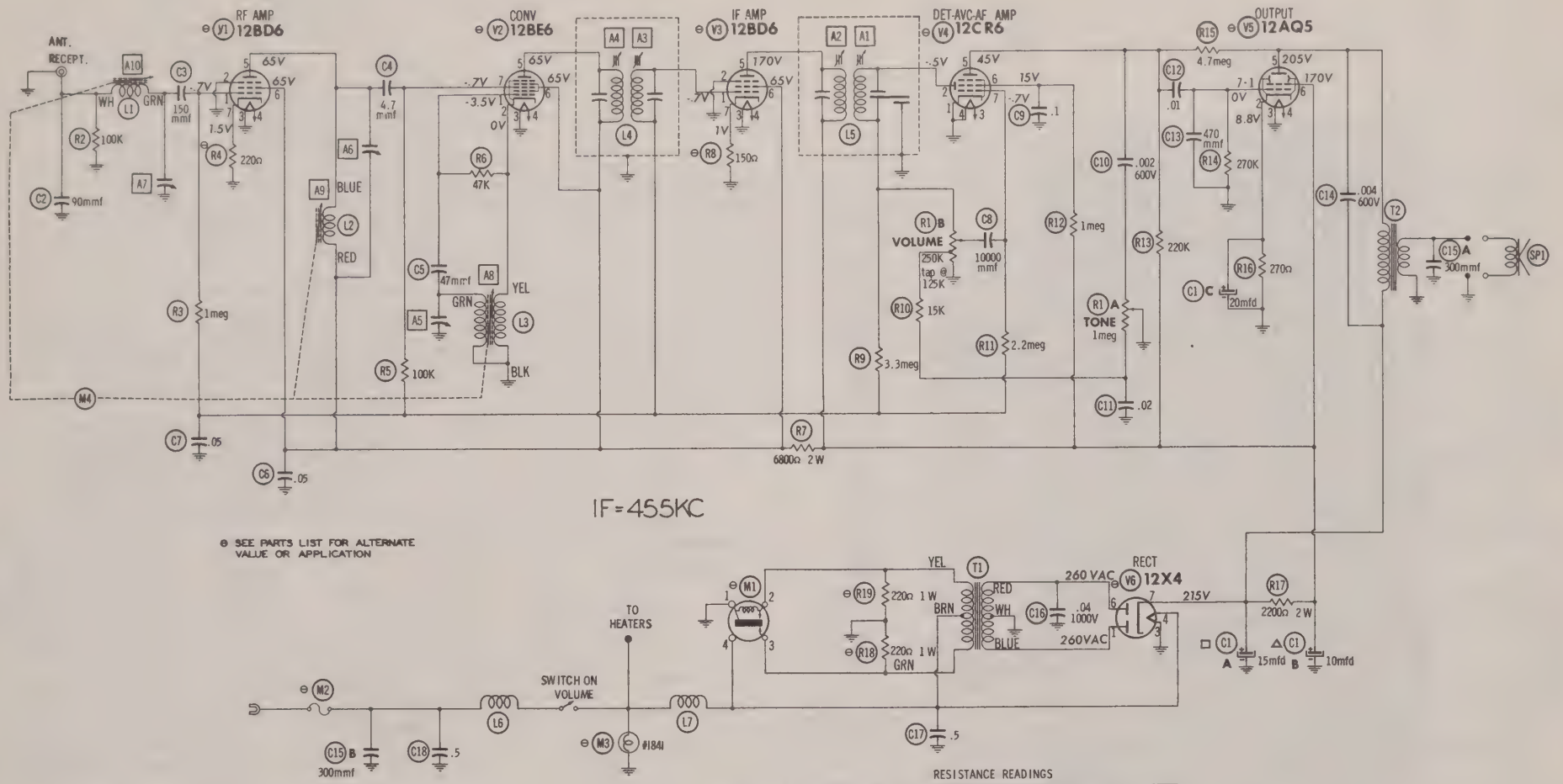

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⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12BD6	4.5Meg	0Ω	0Ω	1.4Ω	†9000Ω	†9000Ω	220Ω
V2	12BE6	47K	.5Ω	0Ω	1.4Ω	†9000Ω	†9000Ω	3.5Meg
V3	12BD6	3.5Meg	0Ω	0Ω	1.4Ω	†2200Ω	†9000Ω	150Ω
V4	12CR6	0Ω	250K	1.4Ω	0Ω	†220K	†1Meg	5.7Meg
V5	12AQ5	270K	270Ω	0Ω	1.4Ω	†375Ω	†2200Ω	270K
V6	12X4	280Ω	NC	0Ω	1.4Ω	NC	260Ω	33K

† MEASURED FROM PIN 7 OF V6.
NC NO CONNECTION

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Battery voltage maintained at 12.6 volts for voltage readings.
5. Nominal tolerance on components values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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PENTRON
MODEL T-90

PENTRON
MODEL T-90

GENERAL INFORMATION

The Pentron Model T-90 utilizes mechanical and electrical facilities for making and playing back tape recordings. Since this unit employs the Pentron TM-56 tape transport mechanism, this service manual may be used when servicing the mechanical functions of any recorder using the TM-56 mechanism.

This recorder has two speeds (3 3/4 and 7 1/2 inches per second) and is designed for dual track recordings, giving two full length recordings on a single reel of recording tape. Any size reel up to 7" may be used on this machine. Recordings can be made from a radio, television receiver or phonograph, in addition to those made directly from the microphone. Recordings can be played back through the self-contained speakers or an external speaker may be used through use of the "Ext. Spkr." jack.

Model T-90 is designed to operate on 60 cycle, 110 to 125 volts, AC supply only. Before connecting to your line supply, be absolutely certain that it agrees with the above specifications.

MANUFACTURED by:

THE PENTRON CORPORATION
777 S. TRIPP AVENUE
CHICAGO 24, ILLINOIS

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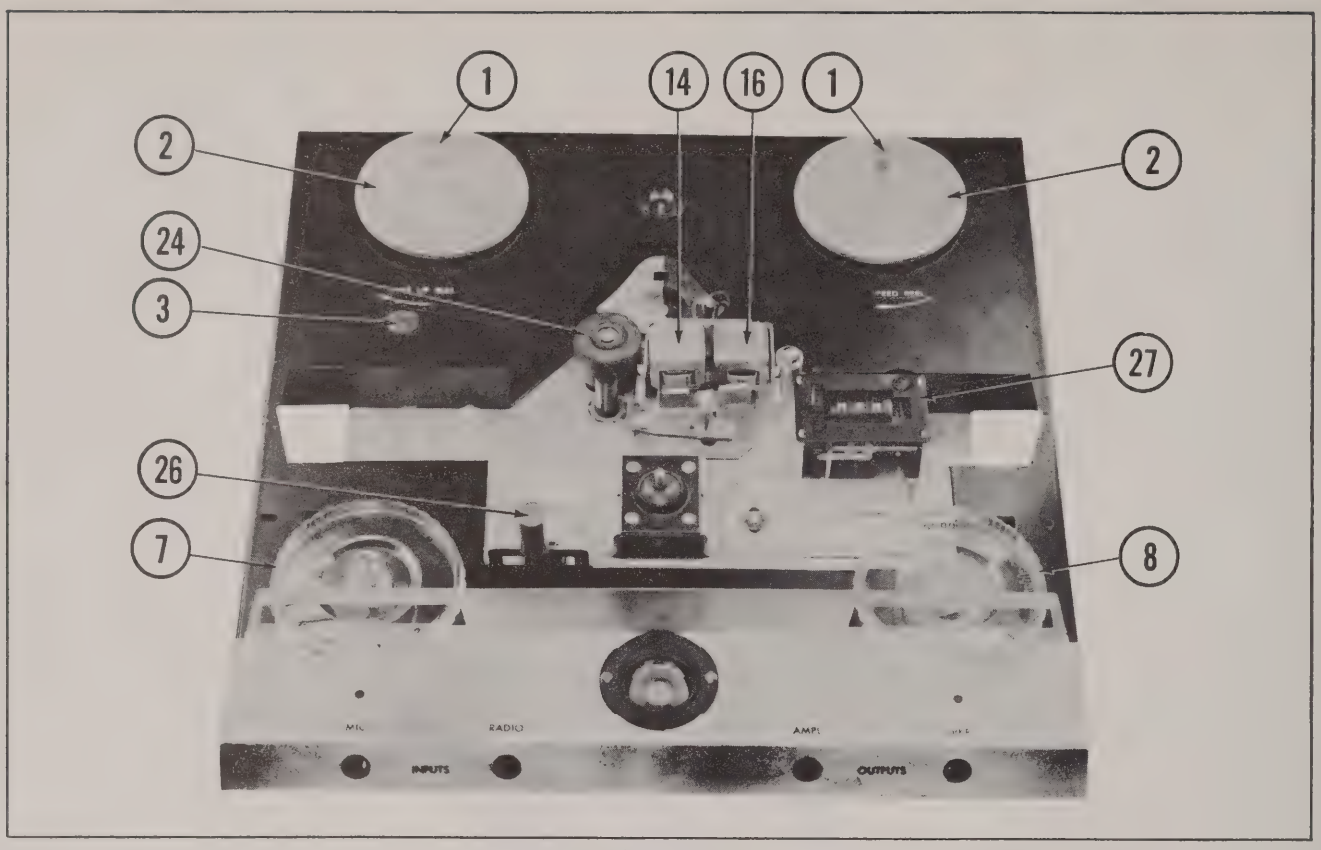


Figure 1

FUNCTIONS OF THE CONTROLS

Speed Control-

This recorder is designed to record and play back at two separate speeds, 7 1/2" per second, or 3 3/4" per second. Since quality of recording increases with the speed of the tape it is desirable to use the faster speed when recording musical programs. For voice and other types of recordings where maximum fidelity is not necessary, the slow speed is preferable since it doubles the playing time of a given size reel. To change speed, grasp the speed control shaft (3) and turn it clockwise. While holding it in the clockwise position push it down for fast speed, or pull it up for slow speed, then release.

NOTE: When recorder is not in use, the speed control should be set half-way between the two speed positions. A locator is provided for setting the control in this position.

Volume Control (Amplifier On-Off)-

The switch on this control turns on the amplifier and leaves it in stand-by position when the "Motor On-Off" switch is in the "Off" position. Turning the "Volume" control clockwise increases the volume level for both playing and recording.

Tone Control (Motor On-Off)-

This control starts and stops the mechanism drive motor. Turning the "Tone" control clockwise increases the bass response during playback. This control does not affect bass response during recording since the ideal position for recording is preset at the factory.

NOTE: Separate switches enable you to use amplifier in conjunction with radio tuner, phonograph, or P. A. System.

"Unimagic" Single Lever Control-

Play, Record, Fast Forward and Fast Rewind may be selected with this control. To play, move lever toward front of unit. For fast forward, return control to neutral (upright) and pivot it to the left. To rewind, return control to neutral, then pivot it to the right. Brakes are automatically applied when "Unimagic" control is placed in neutral position.

Record Lock Button-

When this button is down the machine is switched from a reproducer to a recorder. The recorder then erases tape passing in front of the erase head. To record, depress button at the same time "Unimagic" control is placed in the "Play" position. When the "Unimagic" control is returned to its neutral position, the record lock button is automatically disengaged.

Index Counter-

Set counter to zero at the beginning of a reel by rotating the reset knob. Counter automatically gives an accurate guide for location of recorded material anywhere on the tape.

OPERATING INSTRUCTIONS

Threading The Tape-

1. Place a reel of tape on the right hand (feed reel) spindle so that the reel will turn clockwise when tape is pulled from the reel.

NOTE: This recorder uses "A" wound tape, i.e. the dull magnetic coated side faces the center of the reel. If the tape used is type "B" (coated side facing outward) recordings will be made at a very low sound level and playback will be inaudible.

2. Place an empty reel on the left hand spindle (take-up reel). Be sure that both reels are engaged with the 3 fins on each spindle.

3. Reel out about 16" of tape and hold a section straight with both hands. Drop tape into tape slot. Thread the end of the tape into one of the slots in the outer surface of the take-up reel hub. Rotate take-up reel several turns to secure tape to reel and to take up slack between reels.

To Record From Microphone-

1. Insert the microphone plug into the "Mic." jack.

2. Turn the "Volume-On-Off" control to the "On" position. This supplies power to the amplifier.

3. Turn the "Tone-On-Off" control to the "On" position. This supplies power to the motor.

4. Before making a recording it is generally advisable to set the volume at the proper level. To do this, hold the record lock button (26) down and while talking into the microphone in a natural tone, adjust the "Volume" control so that the peaks of the meter deflection do not go past zero, or into the red area of dial calibration.

5. While holding record lock button (26) in the down position, move the "Unimagic" control (5) to the Play position. A recording is now being made and any sounds entering the microphone will be recorded on the tape.

To Record From Radio, TV, Or Phonograph-

1. Using a standard interconnecting cable such as the Pentron accessory cord X-166, fasten the two clips to the loud speaker terminals of the external source, and insert the plug on the other end into the "Radio" input on the recorder.

To Monitor A Recording-

By plugging a set of earphones in the "Ampl." jack the recording may be monitored. In an emergency the microphone will serve as an earphone if plugged into this same jack. Continued use of the microphone in this fashion is not recommended since permanent damage may result.

To Play A Recording-

1. Move the Unimagic control (5) to the "Play" position.

2. Adjust "Volume" and "Tone" controls for desired listening level.

Dual Track Recording-

This recorder is designed so that only one-half the tape width is recorded at a time, thereby resulting in dual-track recording. To make dual-track recording proceed as follows:

1. After a reel of tape has been recorded, i.e. all the tape wound onto the take-up reel, place the "Unimagic" control (5) in neutral (upright) position.

2. Remove the reels from the recorder, turn the full reel over and place it on the right-hand spindle and place the empty reel on the left-hand spindle.

3. Thread the tape and proceed with the recording.

4. After the second track has been recorded the first track is ready to be played, without rewinding, as follows:

(a) Place the full reel on the right-hand spindle and the empty reel on the left-hand spindle.

(b) Thread the tape and set the controls as described under "To Play A Recording".

FUNCTIONS OF PRINCIPAL PARTS

Unimagic Control (5)-

This control has three positions:

1. "P-R" — Play And Record Position.

When the "Unimagic" control (5) is moved into the "P-R" position, the play-record control cam (37) is actuated by the shaft in the control. This pivoting movement of cam (37) allows the pressure roller slide plate (38) to be activated by the pressure roller spring (53) which engages the pressure roller (24) with the capstan (58) which in turn drives the tape at a constant speed. The take-up adjusting lever (50) which is held against the end of slide plate (38) by the take-up spring (52), is pivoted as the slide plate moves forward. This causes the boot on take-up adjusting spring (48) to press against the equalizer bar (66) with just enough pressure for the take-up belt (78) to become taut and to rotate the take-up pulley (79) so as to wind tape on the reel. This acts as a clutch by allowing the belt to slip due to the slower speed of the capstan. Also, by the movement of slide plate (38), pressure is removed from the pressure finger lever (40), which has been engaged with the pressure pad pivot pin on the pressure pad carrier (32), which holds the pressure pads away from the heads. When pressure is removed from the pressure finger lever (40) the pressure pad spring (41) pulls the pressure pad carrier (32) inward causing pressure pads (22) to bear against the tape and hold it in positive contact with the heads.

NOTE: Mechanical functions explained above pertain to both Play and Record.

2. "R" — Rewind.

When the "Unimagic" control (5) is pivoted to the "R" position the wind-rewind slide plate (42) is activated by the shaft under the "Unimagic" control. The wind-rewind slide plate (42) in turn pushes on the tie bar (61) which bears against the equalizer bar (66) via an elastic stop nut and spacer which causes the equalizer bar (66) to pivot counter-clockwise. The pivoting of the equalizer bar makes the feed belt (60) taut which in turn drives the feed pulley (72) at a high rate of speed.

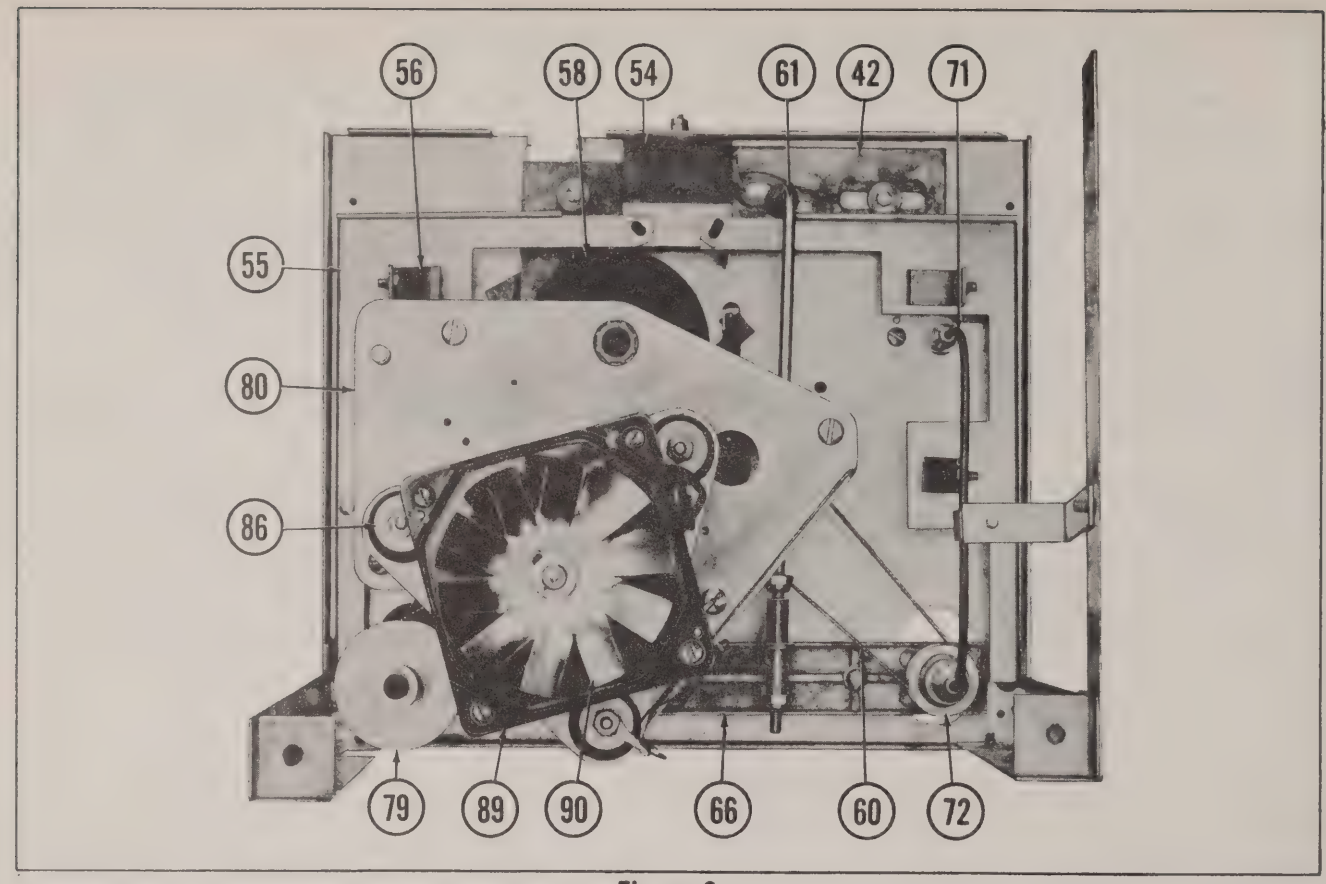


Figure 2

3. "W" (Wind) — Fast Forward.

When "Unimagic" control (5) is pivoted to the "W" position, the wind-rewind slide plate (42) is activated by the shaft under the "Unimagic" control. The wind-rewind slide plate (42) in turn pulls on tie bar (61) which bears against the equalizer bar (66) via an elastic stop nut and spacer which causes the equalizer bar to pivot clockwise. The pivoting of equalizer bar (66) makes the take-up belt (78) taut which in turn drives the take-up pulley (79) at a high rate of speed.

Brakes-

When the "Unimagic" control (5) is in the neutral (upright) position the shaft at the end of this control pushes against the control spring plate (54). The control spring plate then activates the brake arms (55) and (55A) via the brake adjustment screws (67). This action causes the brake arms to pivot, thus putting the brake lining to bear against the under side of the reel rests (2). The brake linings can be seen by removing spindle caps (1) and reel rests (2). When the "Unimagic" control is put in either Play, Rewind, or Wind position, the control spring plate (54) is released thus deactivating the brakes. When control (5) is returned to neutral from the rewind position the control spring plate (54) is pivoted counter-clockwise thus activating the left brake arm (55) before the right brake arm (55A) in order to avoid spillage of tape. When returning control (5) to neutral from the Fast Forward "W" position the control spring plate (54) is pivoted clockwise thus activating the right brake arm (55A) before the left brake arm (55) in order to avoid spillage of tape.

ADJUSTMENTS

Equalizer Bar Adjustments-

This adjustment is made by loosening socket head screw (11) and shifting equalizer bar (66) forward or backward. Make adjustments as follows:

First, remove spindle caps (1) and reel rests (2). With the "Unimagic" control (5) in the neutral (upright) position, move the equalizer bar (66) to a position such that the take-up spindle (69) is on the verge of spinning without any pressure being exerted on the equalizer bar (66) from the tie bar (61). After adjustment is made be sure socket head screw (11) is tightened securely. The equalizer bar adjustment screws (68) are adjusted by turning both screws down until they hit the mechanism plate. Then back the screws off 1/4 of a turn and lock them down with lock nuts (67). This adjustment acts as a stabilizer for the equalizer bar.

NOTE: To gain access to socket head screw (11) an aluminum cap covering the screw must be pryed off.

Tie Bar Pressure Adjustment-

The amount of pressure exerted on the equalizer bar (66), by means of the tie bar (61), is adjusted by movement of the elastic stop nuts (62). The elastic stop nuts should be adjusted so as to allow the Wind and Rewind positions on the Unimagic control to function freely and still exert enough pressure on the equalizer bar (66) for adequate Wind and Rewind performance. To determine if performance is adequate

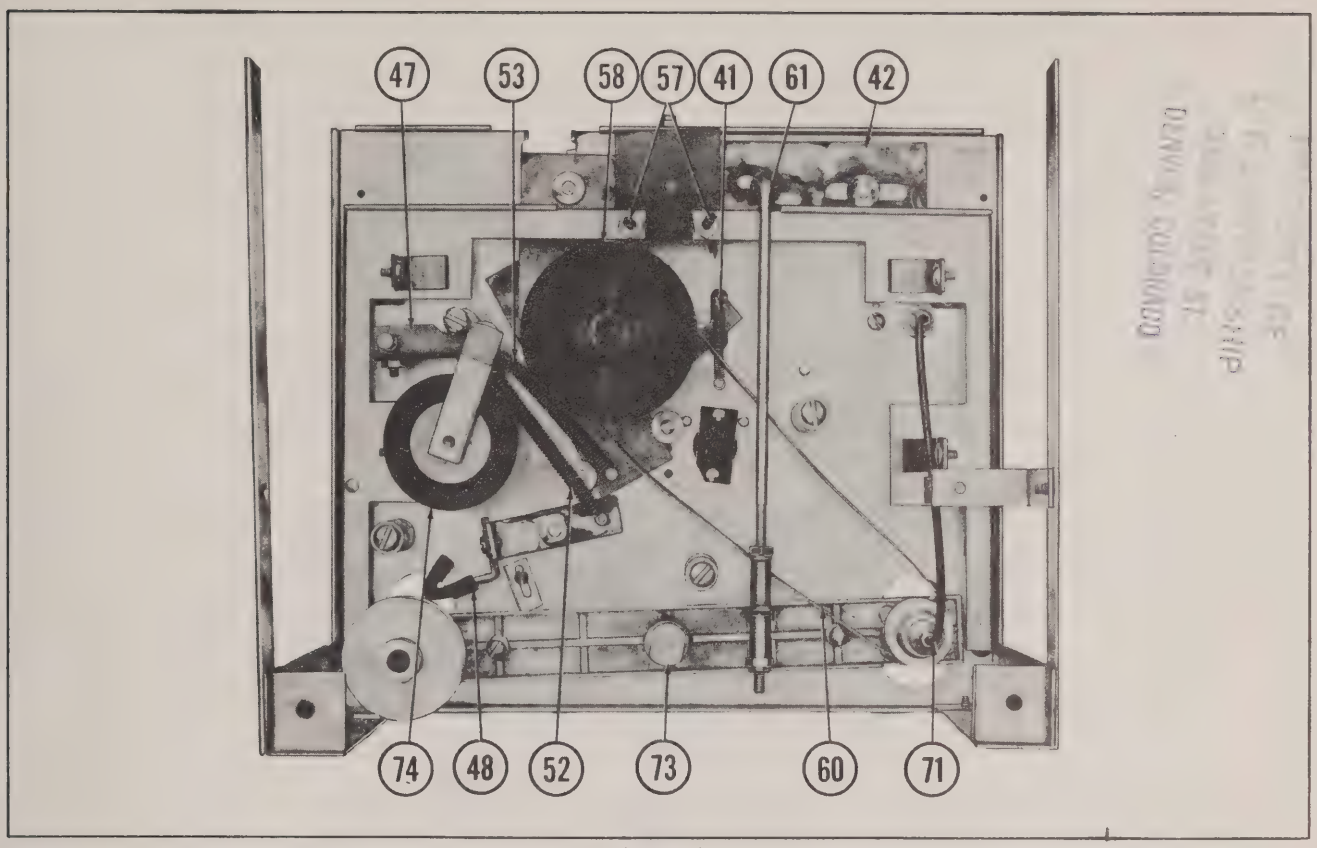


Figure 3

test the Rewind with a full 7" reel on the feed side. To test for Wind place full 7" reel on take-up side.

NOTE: The tie bar (61) must be readjusted whenever equalizer bar (66) is readjusted.

Take-Up Adjustment-

This adjustment is accomplished by bending the take-up adjusting spring (48). Bending the spring closer to the equalizer bar (66) increases pressure on the equalizer bar thus giving a stronger take-up. Bending the spring away from equalizer bar (66) gives a weaker take-up. If bending spring (48) does not give adequate adjustment, loosen the screw which mounts the spring and move the spring in the proper direction for optimum adjustment.

Brake Adjustment-

After equalizer bar adjustments have been made the brakes are ready to be adjusted. First put a full 5" reel of tape on the feed reel side, and an empty 7" reel on the take up side. Wind about 1/4 of the tape on to the 7" reel. While operating the Unimagic control from "Rewind" to "Neutral", tighten the left brake adjusting screw (57) until the reels stop in about 1 revolution without spilling tape. Next, reverse the procedure by placing the 5" reel of tape on the take-up side and the empty 7" reel on the feed side. Adjust the right brake adjusting screw (57) so that the reels stop in "Fast Forward" to "Neutral" in about 1 revolution. Next put a full 7" reel of tape on the feed side and an empty 7" reel on the take-up side. Run about 100' of tape on to the take-up reel and go directly into "Rewind". When the take-up reel is almost empty, place the Unimagic control in "Neutral". The reels should stop in about 3 or 4 revolutions without spilling tape. Next, reverse the procedure by placing the full 7" reel on the take-up side and rewind about 100' of tape on the feed reel. Go directly into "Fast Forward" until the feed reel is almost empty. Then place Unimagic control in "Neutral". The reels should stop in about 3 or 4 revolutions without spilling tape. After brakes are adjusted, check the take-up and rewind. If the take-up or rewind has been affected, readjust. If it is difficult to get adequate take-up, brakes may have been adjusted too tight. Then readjust brakes to rectify this condition.

Idler And Speed Change Adjustment-

Loosen the set screw and nut which secures idler shaft (46) to idler channel (47). Adjust position of idler channel assembly (47) so that the full perimeter of idler wheel (74) rides on the perimeter of motor pulley (76). While adjusting, position the height of idler shaft (46) so that its roll pin will locate in the slot in the shaft housing. Idler wheel (74) must be adjusted so as not to ride on the edge of the motor pulley.

Flexible Shaft Adjustment-

This adjustment is made by shifting the cable clamp support bracket to a position so that a light downward pressure is exerted of flexible shaft (71) so as to keep it from whipping when machine is in "Fast Forward" or "Rewind" position.

Play-Record Head Alignment-

To align the play-record head (14) a special head alignment wrench is necessary. An alignment tape is recommended for accurate alignment.

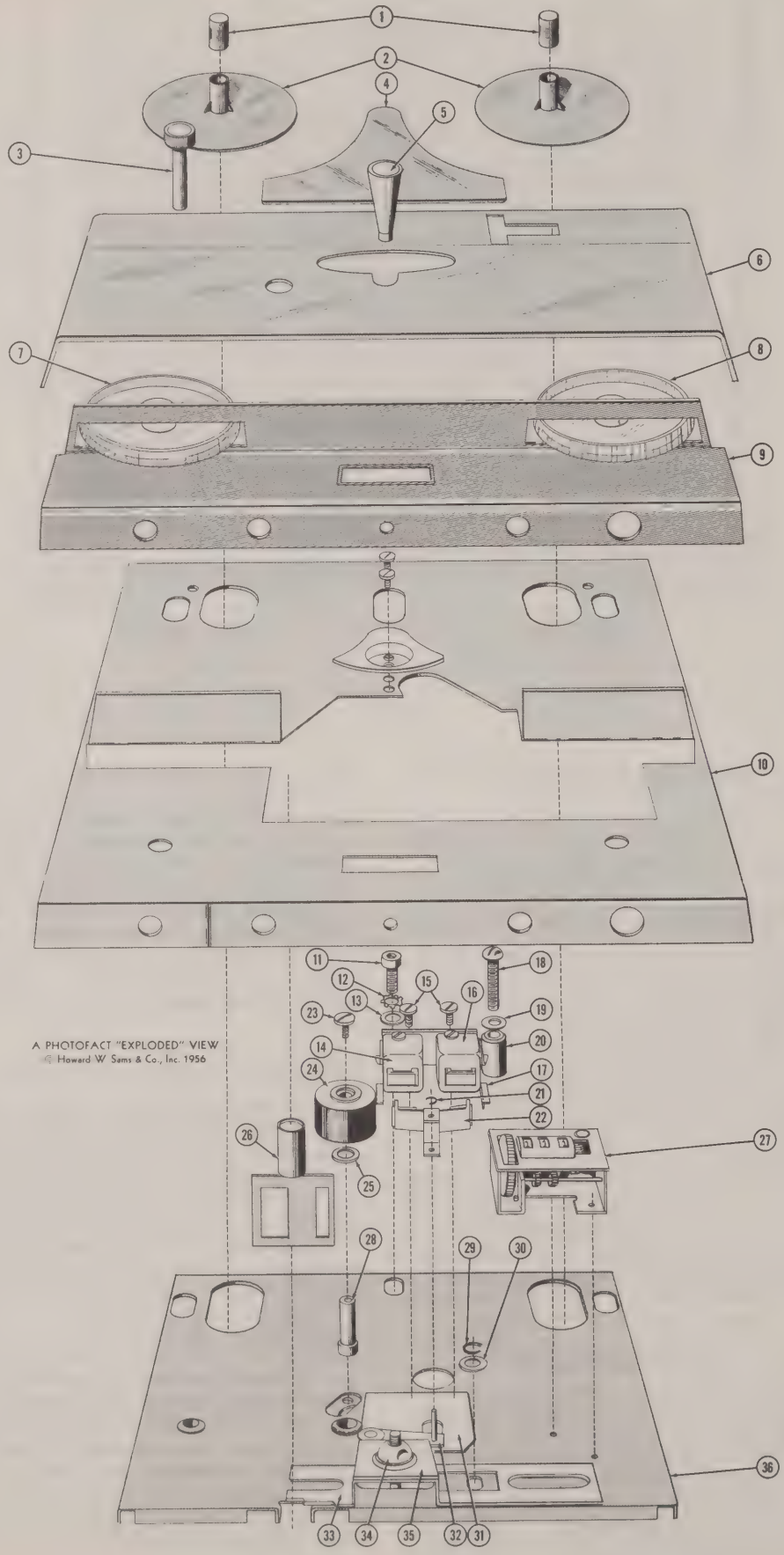


FIGURE 4A. EXPLODED VIEW OF PARTS ABOVE BASEPLATE

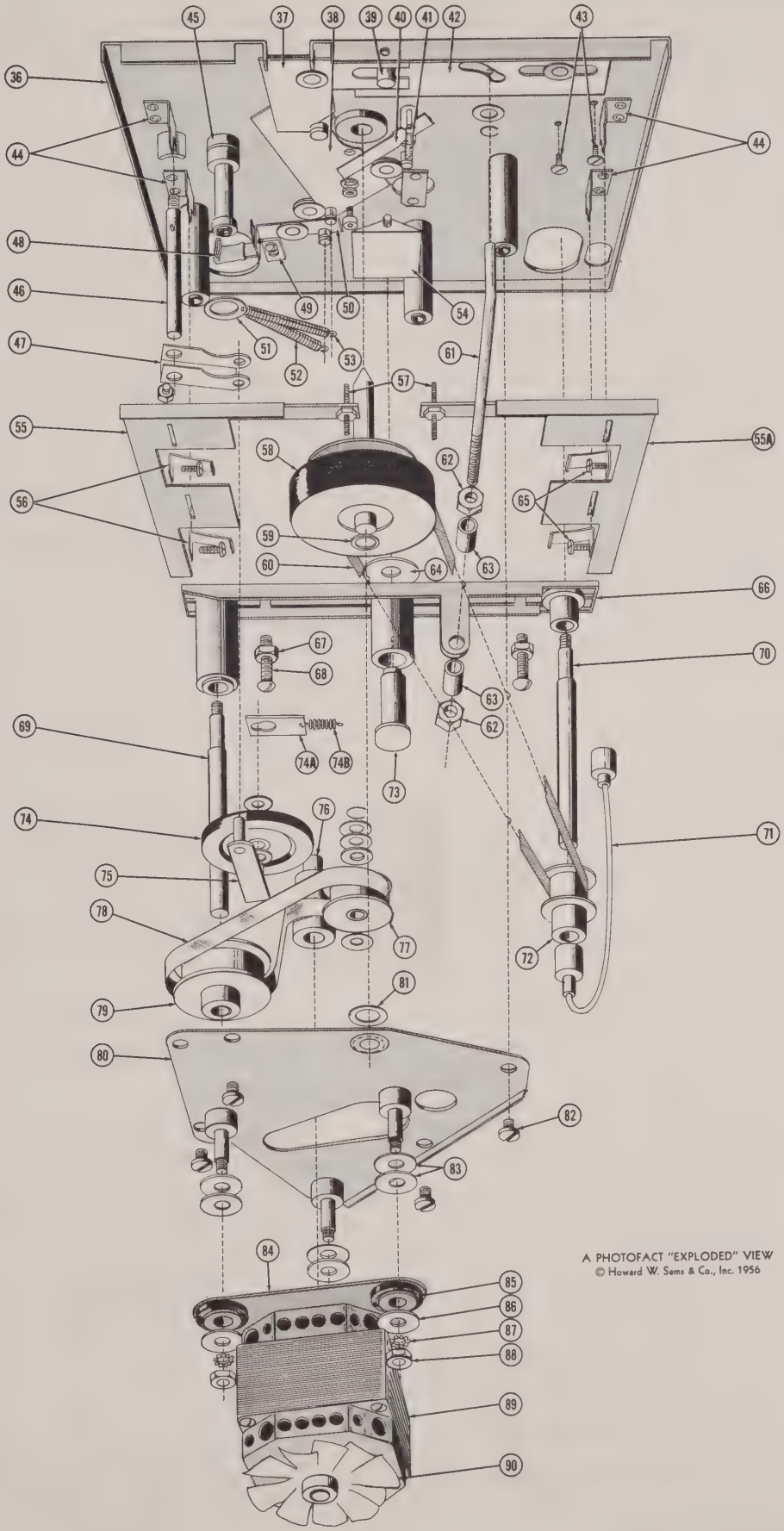


FIGURE 4B. EXPLODED VIEW OF PARTS BELOW BASEPLATE.

To align head for azimuth, slip the alignment wrench over the head can and rock head while tape is playing until maximum output is obtained. This can be readily heard because the high frequency notes will be apparent rather than the low mellow sounds. After the head is aligned it must be secured by tightening the back screw and sealing it with household cement. If the height of the head has been disturbed, the center line of the head and pole piece must be lined up so that the pole piece is at the same level as the tape guides and tape.

How To Replace A Pole Piece-

Remove the head assembly by loosening the two mounting screws which hold down the head assembly. The pole piece is then removed by inserting a non-magnetic screw driver between the head can and the pole piece and prying the pole piece loose by breaking the glue joint. The new pole piece is then inserted between the two laminations provided for each leg of the pole piece and gluing it from the sides with household cement. The head assembly is then screwed into place and the heads aligned.

LUBRICATION

Although this mechanism is prelubricated at the factory, replacement of parts require that they be lubricated in order to insure proper functioning. No part need more than a slight film of grease where grease is specified or one drop of oil where oil is specified.

The following parts require greasing with fibre grease or a similar compound:

1. Play-record cam (37).
2. Wind-rewind slide plate (42).
3. Control spring (54).
4. Control shaft (34), bottom end.
5. Slide plate assembly (38).
6. Pressure roller bearing (24) and (28).
7. Belt pulley (77).
8. Tie bar (61), front end.
9. Idler wheel bearing (74).
10. Clamp for flexible cable (71).
11. Record lock (26).
12. Equalizer bar pivot stud (66).
13. Take-up adjusting lever (50).
14. Pressure arm lever (40).
15. Pressure finger carrier assembly (32).

The following parts require oiling with 10 W lubricating oil:

1. Feed spindle assembly (70).
2. Take-up spindle assembly (69).
3. Flywheel assembly (58).

CAUTION: Do not clean oilite bearings with cleaning solvent. Oilite bearings are permanently oiled, but in some instances where the bearings appear dry a drop of oil will be necessary.

CLEANING

The play-record head (14), erase head (16), capstan (58), and pressure roller (24) are subject to an accumulation of tape coating oxide which is worn off the tape as it passes these parts. Clean these parts with a soft cloth and alcohol after every ten hours of running time.

TROUBLES AND PROBABLE REMEDIES

No Rewind-

1. Glazed idler wheel (74). Rub off slickness with a clean, dry, lint free cloth.

2. Faulty tie rod (61) adjustment. Adjust as described under "Tie Bar Pressure Adjustment".

3. Slippage of idler wheel (74) against flywheel or motor pulley. Clean idler wheel, flywheel, and motor pulley with alcohol. If idler wheel still slips, replace.

4. Idler wheel (74) not adjusted properly. Adjust as described under "Idler And Speed Change Adjustment".

5. Binding feed reel spindle (70). Loosen the set screw in rewind pulley (72). Clean bearing and spindle surface and reinstall leaving .005 and play in assembly.

6. Dragging brake linings. Brakes not properly adjusted. Adjust brakes as described under "Brake Adjustment".

7. Bent reel rest (2). Replace reel rest.

8. Feed belt (60) loose or broken. Replace.

Flutter-

1. Motor pulley (76) not concentric to motor shaft. Replace motor and pulley assembly.

2. Excessive take-up. Adjust as described under "Take-Up Adjustment".

3. Take-up belt (78) not installed properly. Remove and replace belt as shown on Exploded View.

4. Dirty flywheel bearings. Clean bearings and flywheel shaft.

Wow-

1. Foreign matter on idler wheel (74), motor pulley (76), flywheel (58), or take-up pulley (79). Clean all wheels and pulleys with clean cloth and alcohol.

2. Defective idler wheel (74). Replace.

3. Defective pressure roller (24). Replace.

4. Reel spindles (69) and (70) binding. Loosen set screw on pulley, clean bearing and spindle surface. Reinstall leaving .005 end play in assembly.

5. Brakes improperly adjusted. Adjust as described under "Brake Adjustment".

No Wind (Fast Forward)-

1. Binding take-up spindle (69). Loosen set screw in take-up pulley (79), clean bearing and spindle surface and reinstall leaving .005 end play in assembly.

2. Take-up belt (78) loose, twisted, or broken. Replace belt.

Tape Spillage Or Insufficient Braking-

1. Faulty brake adjustment. Adjust brakes as described under "Brake Adjustment".

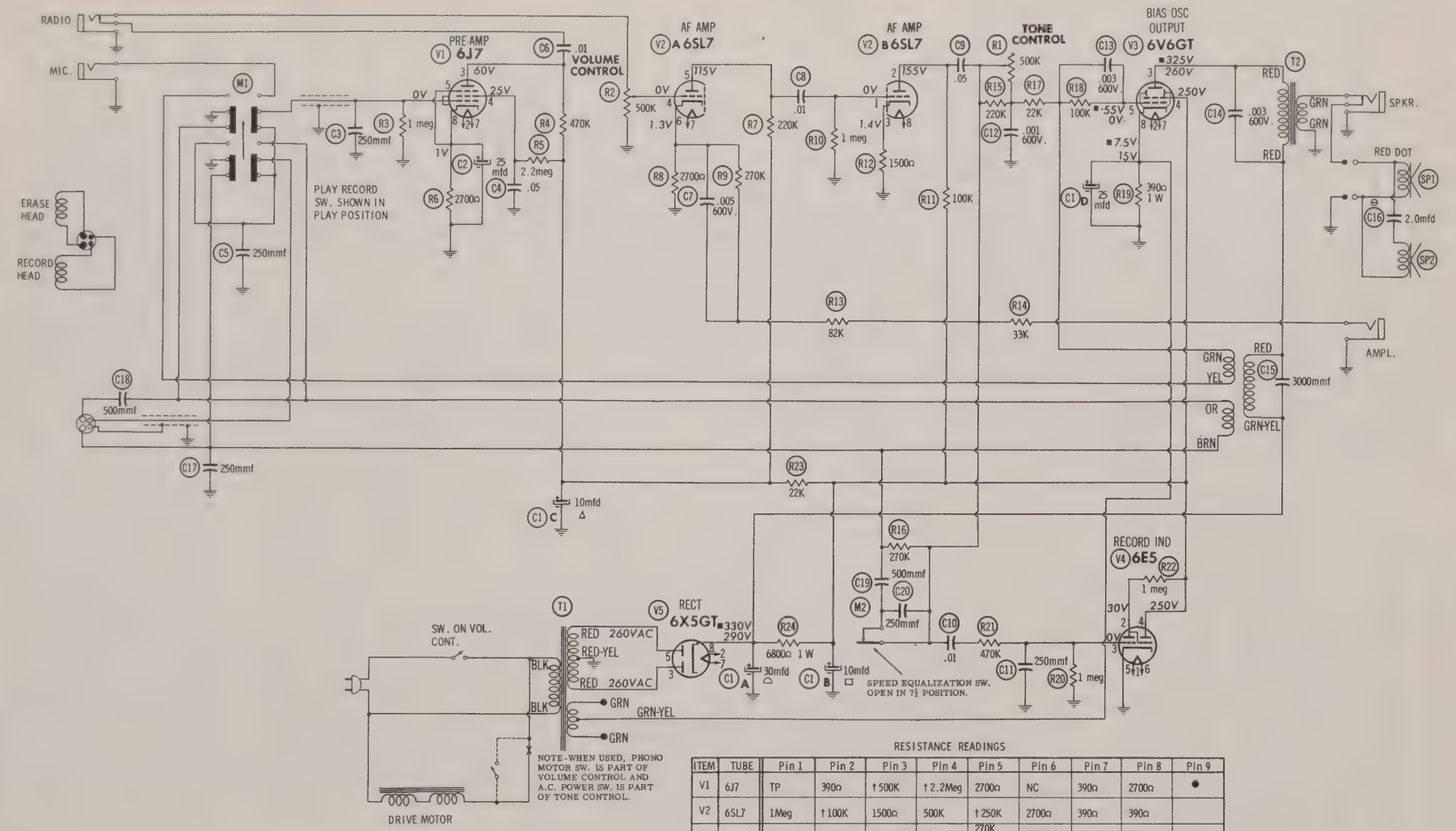
2. Worn brake linings. Replace linings and readjust brakes.

3. Worn-out or loose control spring (54). Adjust or replace control spring.

4. Excessive play in equalizer bar (66). Readjust equalizer bar as described under "Equalizer Bar Adjustments".

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
1	714-A-276	Reel Spindle Cap	48	964-A-121	Take-Up Adjusting Spring
2	765-B-12	Reel Rest	49	711-A-209	Take-Up Stop Plate
3	714-A-474	Idler Shaft Knob	50	964-A-129	Take-Up Adj. Lever Assy.
4		Head Cover Casting	51	711-A-207	Spring Ring
5	714-A-473	Control Knob, Unimagic	52	712-A-5	Take-Up Pressure Spring
6		Control Plate Casting	53	712-A-6	Pressure Roller Spring
7		Volume Control Knob	54	742-A-23	Control Spring
8		On-Off-Tone Control Knob	55	711-C-139	Left Brake Arm
9		Front Escutcheon	55A	711-C-140	Right Brake Arm
10		Top Cover Panel	56	742-B-1	Brake Pivot Spring
11	613-10896	#10-32 x 1/2" Sckt. Hd. Cap Screw	57	613-81606	#8-32 x 1" Allen Hd. Cup Pt. Set Screw
12	617-1134	#10 Ext. Tooth Lockwasher	58	714-A-471	Capstan
13	616-1144	.187 x .437 x .031 Plain Washer	59	871-23	Felt Washer
14	943-A-11	Record Head - Dual Track	60	899-A-2	Feed Belt, .312 x 17.25
15	611-80454	#8-32 x 1/4 B. H. M. S.	61	714-B-3	Tie Bar
16	943-A-10	Erase Head - Dual Track	62	615-1124	#10-32 Elastic Stop Nut
17	711-A-345	Tape Guide	63	714-A-182	Tie Bar Spacer
18	611-11615	#10-32 x 1" Rd. Hd. Mach. Screw	64	714-A-185	Equalizer Spacer
19	616-1144	.187 x .437 x .031 Plain Washer	65	611-80454	#8-32 x 1/4 B. H. M. S.
20	714-A-102	Dummy Stop	66	964-B-19	Equalizer Bar & Bearing Assy.
21	619-144	.125 "C" Washer	67		Lock Nut
22	964-A-124	Pressure Pad & Plate Assy.	68		Equalizer Bar Adj. Screw
23	611-60353	#6-32 x 3/16 B. H. M. S.	69	714-A-462	Take-Up Reel Spindle
24	964-A-116	Capstan Pressure Roller	70	714-A-463	Feed Reel Spindle
25	616-A-3169	.250 x .500 x .010 Clock St'l. Washer	71	529-A-16	Flexible Shaft
26		Record Lock Button	72	714-A-135	Rewind Pulley
27	498-A-2	Counter	73	714-A-183	Equalizer Bar Pivot Stud
28	714-A-47	Capstan Roller Shaft	74	964-A-115	Idler Wheel
29	619-146	.188 "C" Ring	74A	711-A-346	Idler Spring Clip
30	619-A-24	.190 x .375 x .010 Clock St 1. Washer	74B		Idler Spring
31	711-A-347	Shield Plate	75	964-A-139	Idler Bracket Sub Assy.
32	964-A-114	Pressure Pad Carrier Assy.	76	714-A-167	Motor Pulley
33	711-B-134	Control Support	77	714-A-171	Belt Pulley
34	964-A-268	Control Assembly	78	899-A-3	Take-Up Belt, .312 x 12.625
35	711-A-592	Ball Retainer	79	964-A-91	Take-Up Pulley
36	711-C-137	Mechanism Plate	80	711-B-75	Motor Support Plate
37	711-B-135	Play & Record Control Cam	81	616-A-9209	.377 x 5/8 x .01 Clock St'l. Washer
38	964-A-23	Slide Plate Assy.	82	611-10554	#10-32 x 5/16 B. H. M. S.
39	714-A-472	Control Shaft	83	711-A-341	.218 x 7/8 x 1/32 Motor Mtg. Washer
40	711-A-330	Pressure Arm Lever	84	711-A-342	Motor Plate
41	712-A-21	Pressure Pad Spring	85	855-A-8	Shock Mount
42	711-B-133	Wind & Rewind Slide Plate	86	711-A-341	.218 x 7/8 x 1/32 Motor Mtg. Washer
43	611-60454	#6-32 x 1/4 B. H. M. S.	87	617-8114	#8 Int. Tooth Lockwasher
44	711-A-594	Brake Support	88	614-8114	#8-32 Hex. Nut
45	714-A-161	Plate Stud	89	367-B-6	Motor
46	714-A-336	Idler Shaft	90	717-A-20	Motor Fan
47	711-A-343	Idler Channel			



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6J7	TP	390Ω	†500K	†2.2Meg	2700Ω	NC	390Ω	2700Ω	●
V2	6SL7	1Meg	†100K	1500Ω	500K	†250K	2700Ω	390Ω	390Ω	
V3	6V6GT	TP	390Ω	†580Ω	†6800Ω	270K ■ 100K	TP	390Ω		
V4	6E5	390Ω	†1Meg	1Meg	†6800Ω	0Ω	390Ω			
V5	6X5GT	TP	290Ω	460Ω	TP	400Ω	NC	390Ω	28K	

ALL MEASUREMENTS TAKEN IN PLAY POSITION UNLESS OTHERWISE INDICATED
● DO NOT MEASURE
† MEASURED FROM PIN 8 OF V5.
■ MEASURED IN RECORD POSITION.
NC NO CONNECTION
TP TIE POINT

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Preamplifier	6J7	
V2	AF Amplifier	65L7	
V3	Bias Osc-Output		
V4	Record Ind	6E5	
V5	Rectifier	6X5GT	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA PENTRON PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲30	350		AFH4-68	D054	FP431	TM-4079	Q-210	TVL-4729
B	■10	350							
C	▲10	350							
D	25	25							
C2	25	25		PRS25V25	BR252	TC26	TD-25-25	FM-0225	TVA-1205

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA PENTRON PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C3	250			BPD-00025	DD-251	G053	811-251	UC-5325	5GA-T25	
C4	.05	400		BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C5	250			BPD-00025	DD-251	G053	811-251	UC-5325	5GA-T25	
C6	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	5GA-T25	
C7	.005	600		SI5000	D6-502	CUB6D5	GP2-333-502	PT625	6TM-D5	
C8	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C9	.05	400		BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C10	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C11	250			BPD-00025	DD-251	G053	811-251	UC-5325	5GA-T25	
C12	.001	600		SI1000	D6-102	CUB6D1	GP2L-102	PT621	6TM-D1	
C13	.003	600		SI3000	D6-302	CUB6D3	GP2-333-302	PT623	6TM-D3	
C14	.003	600		SI3000	D6-302	CUB6D3	GP2-333-302	PT623	6TM-D3	
C15	3000	500		1464-003		1R5D3		MCB461	MS-23	
C16	2.0	50		P282Z-2.0		MP2W2				Note #1.
C17	250			BPD-00025	DD-251	G053	811-251	UC-5325	5GA-T25	
C18	500			BPD-0005	DD-501	K061	811-501	UC-535	5GA-T5	
C19	500			BPD-0005	DD-501	K061	811-501	UC-535	5GA-T5	
C20	250			BPD-00025	DD-251	G053	811-251	UC-5325	5GA-T25	

Note #1. Some versions may use a non-polarized electrolytic in this application.

CONTROLS

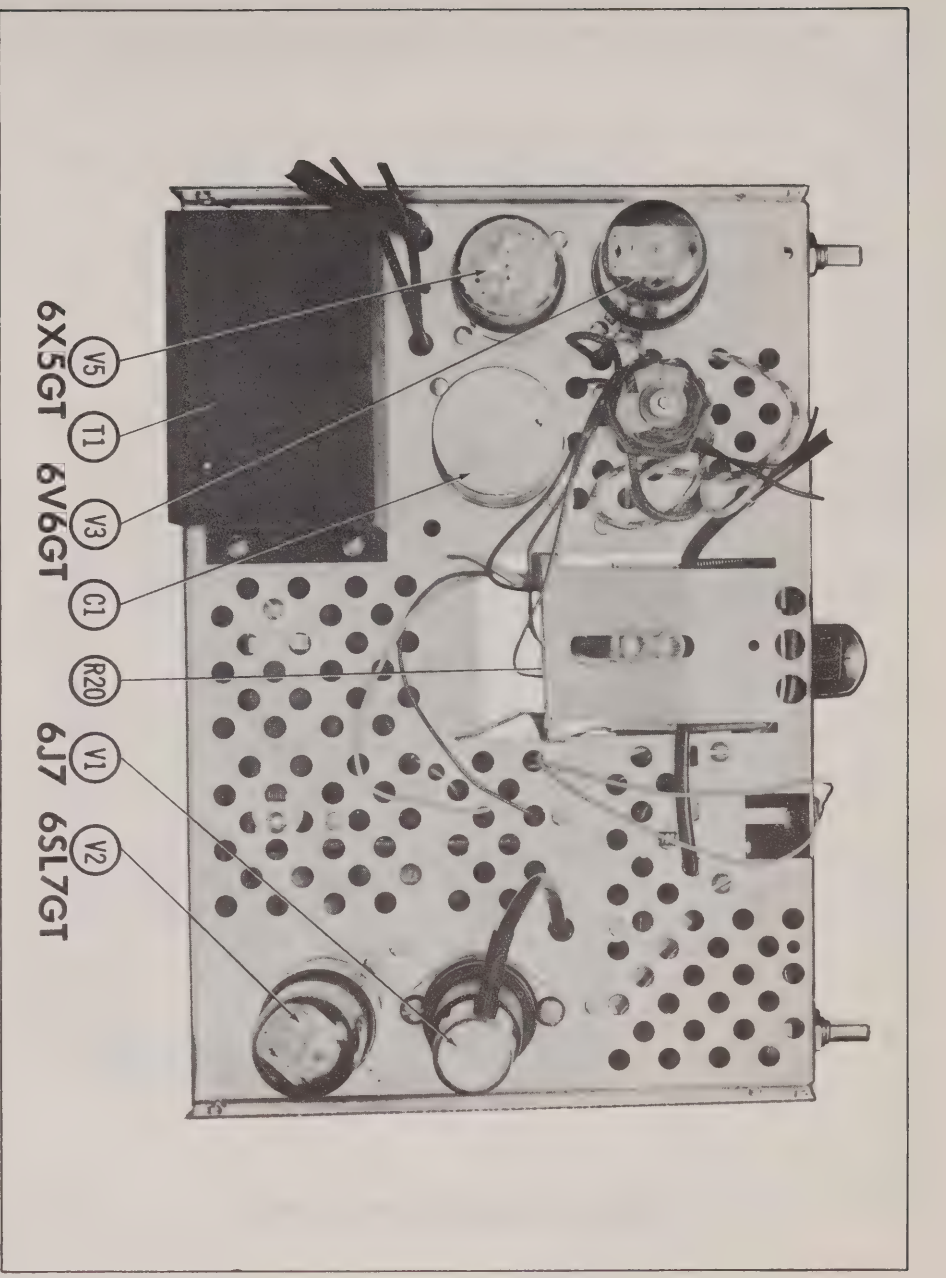
ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA PENTRON PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500KΩ	½	126A50413-4	B-60-S	A47-500K-Z	Q13-133	U48	Tone
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	Not Req.	SWE-12	76-1	US-26	Attach to R1A
R2A	500KΩ	½	124A50413-7	B-60	A47-500K-Z	Q13-133	U48	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R2A

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA PENTRON PART No.	IRC PART No.	NOTES
R3	1Meg			BTS-1Meg	
R4	470K			BTS-470K	
R5	2.2Meg			BTS-2.2Meg	
R6	2700Ω			BTS-2700	
R7	220K			BTS-220K	
R8	2700Ω			BTS-2700	
R9	270K			BTS-270K	
R10	1Meg			BTS-1Meg	
R11	100K			BTS-100K	
R12	1500Ω			BTS-1500	
R13	82K			BTS-82K	
R14	33K			BTS-33K	
R15	220K			BTS-220K	
R16	270K			BTS-270K	
R17	22K			BTS-22K	
R18	100K			BTS-100K	
R19	390Ω	1		BTS-390	
R20	1Meg			BTS-1Meg	
R21	470K			BTS-470K	
R22	1Meg			BTS-1Meg	
R23	22K			BTS-22K	
R24	6800Ω	1		BTA-6800	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	PENTRON PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ .33A	530VCT @ .042A	6.3VCT @ 1.84A		352-17					

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	PENTRON PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	5.8KΩ	3-4Ω	342-12	Z1007	A-3019	A-3849	26S49	S-5Z	

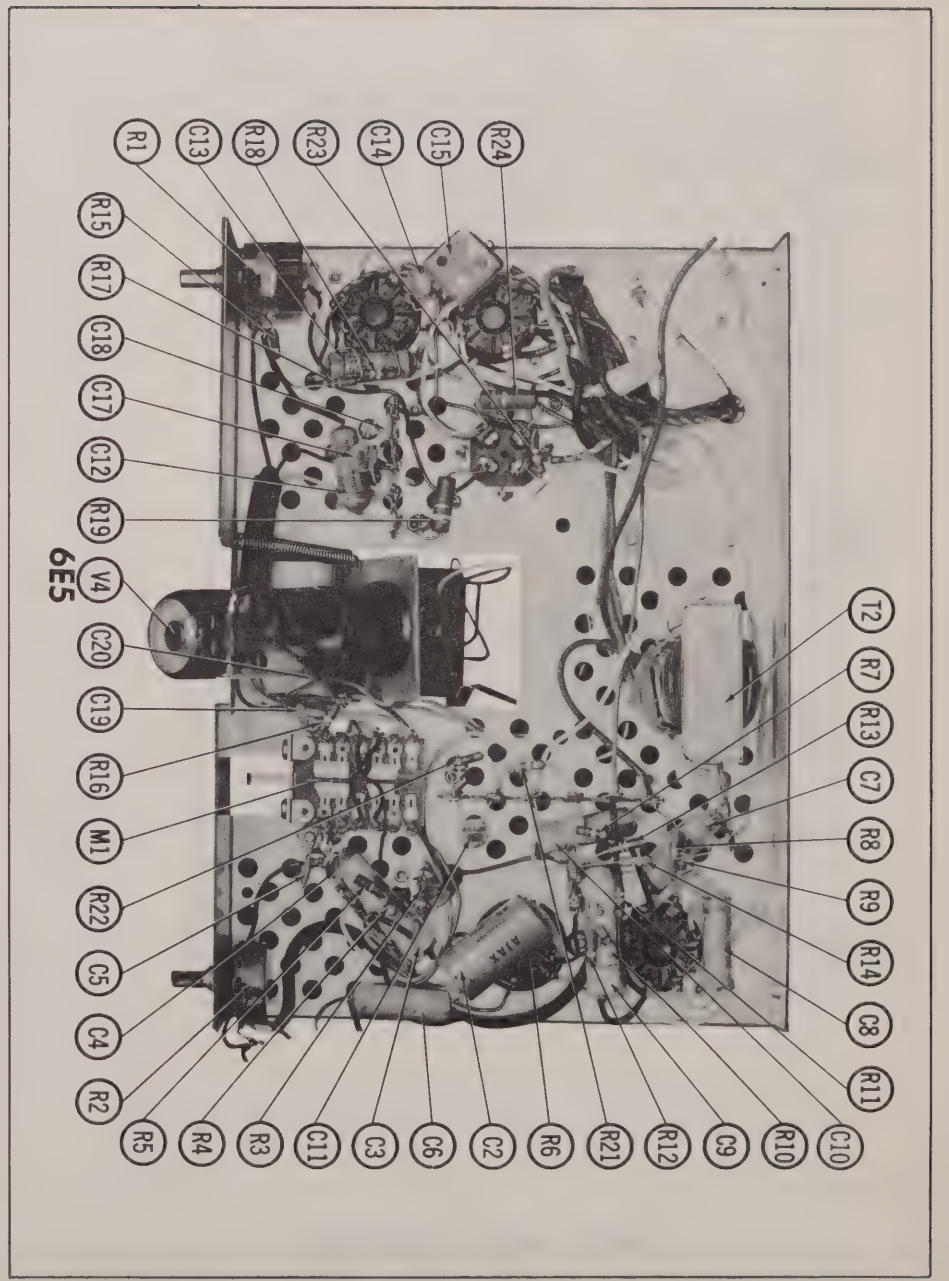
SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	PENTRON PART No.	QUAM PART No.	RCA TYPE No.	
SP1	6"	PM	3-4Ω	345-19	6A1	229S1	
SP2	4"	PM	3-4Ω	345-18	4A07	223S1	

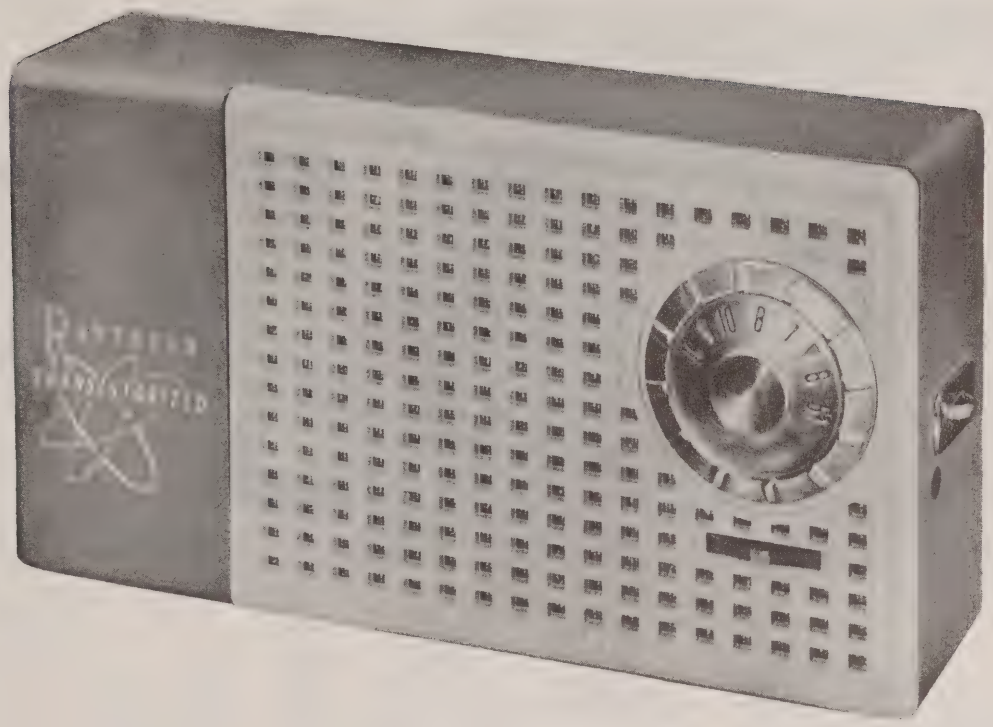
MISCELLANEOUS

ITEM No.	PART NAME	PENTRON PART No.	NOTES
M1	Switch	534A3	Play-Record (4PDT-Slide Type)
M2	Switch		Speed Equalization

CHASSIS—BOTTOM VIEW



RAYTHEON MODELS T-100-1, -2, -3, -4, -5 (Ch. 4RT1)



RAYTHEON MODELS T-100-1, -2, -3, -4, -5 (Ch. 4RT1)

TRADE NAME	Raytheon Models T-100-1, T-100-2, T-100-3, T-100-4, T-100-5 (Ch. 4RT1)
MANUFACTURER	Raytheon Mfg. Co., TV & Radio Div., 5921 W. Dickens Ave., Chicago 39, Ill.
TYPE SET	Battery Operated Portable Transistor AM Superheterodyne Receiver
POWER SUPPLY	9 Volts "A" Supply
TUNING RANGE—BROADCAST	540KC - 1600KC RATING 12MA @ 9 Volts DC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maxiumum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.5MFD	High side to base of X1. Low side to chassis.	455KC (400~ Mod)	Tuning gang fully open.	Across voice coil.	A1, A2	Adjust for maximum output. Repeat for best results.
2.	"	"	1620KC	"	"	A3	Adjust for maximum output.
3.	"	"	535KC	Tuning gang fully closed.	"	A4	"
4.	"	"	1620KC	Tuning gang fully open.	"	A3	"
5.		Loop	1400KC	Tune to 1400KC signal.	"	A5	Adjust for maximum output while rocking tuning gang.

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PARTS LIST AND DESCRIPTIONS

RAYTHEON
MODEL T-100-1 (CH. 4RT1)

TRANSISTORS

ITEM No.	USE	TYPE	NOTES
X1	Converter	2N112	Note 1
X2	IF Amplifier	2N112	Note 1
X3	AF Amplifier	2N132	
X4	Output	2N138	

Note 1: Some versions may use type CK-760 in this application.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	RAYTHEON PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	50	10	8C-26454	XPP10V50	EC50-10		ML-50-10		R2279*
C2	6	3	8C-26455	XPP3V6	EC6-3	TAW4A6	ML-6-3		R2280*
C3	6	3	8C-26455	XPP3V6	EC6-3	TAW4A6	ML-6-3		R2280*
C4	50	3	8C-26453	SRE3V50	BBR50-3		ML-50-3		TE-1100
C5	6	3	8C-26455	XPP3V6	EC6-3	TAW4A6	ML-6-3		R2280*

* Non catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	RAYTHEON PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C6	10000		8G-26457	BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C7	10000		8G-26457	BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C8	350		8N1-274							
C9	50000		8G-26459							
C10	15									Note 1
C11	50000		8G-26459							
C12	50000		8G-26459							
C13	10000		8G-26457	BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C14	10000		8G-26457	BPD-01	DD-103	K082	811-01	DC511	5HK-S1	

Note 1: Some versions may use 10MMF in this application (part no. 8L-26471)

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	RAYTHEON PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	10K	½	B-10A-26383					Volume & Switch

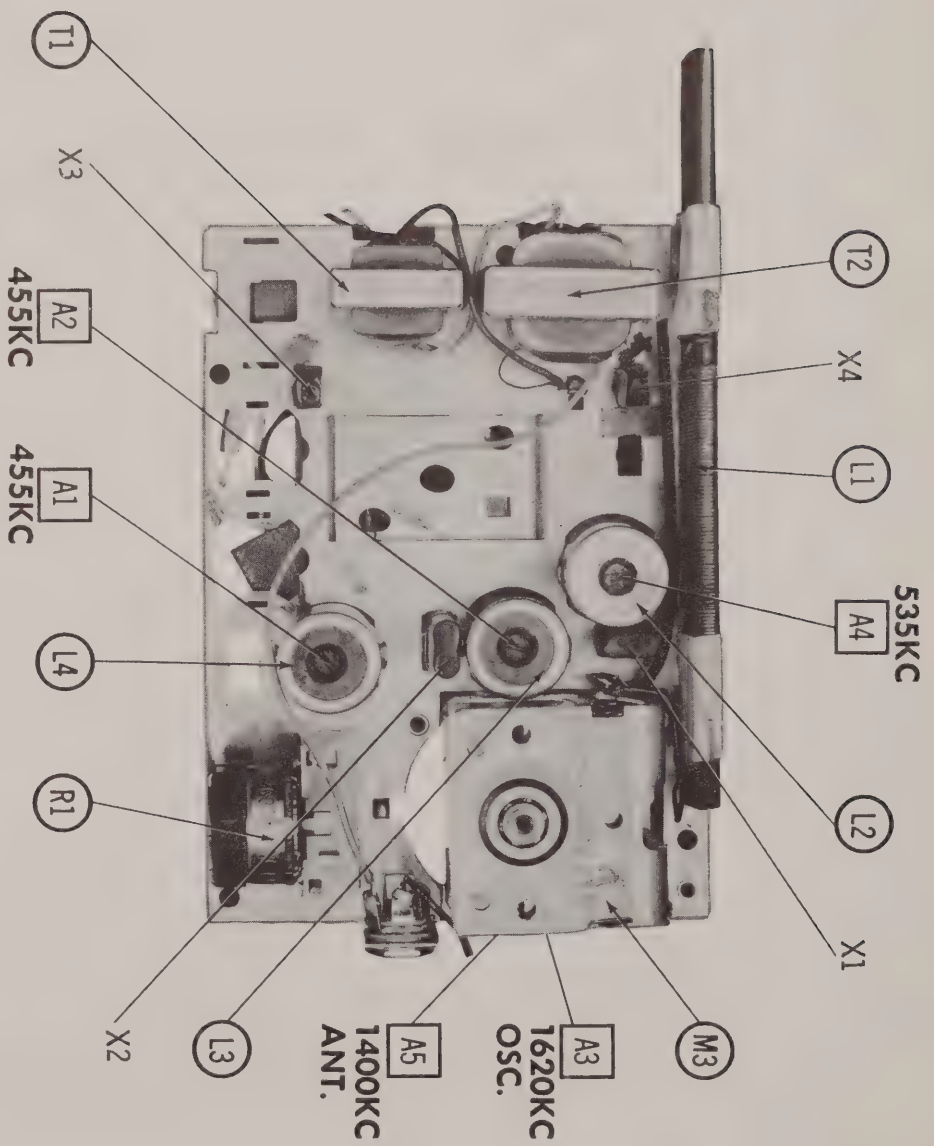
RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	RAYTHEON PART No.	IRC PART No.	
R2	33K		9B5-80	BTR-33K	
R3	18K		9B5-77	BTR-18K	
R4	5100Ω 5%		9B5-176	BTR-5100 5%	
R5	1000Ω		9B5-62	BTR-1000	
R6	1000Ω		9B5-62	BTR-1000	
R7	1000Ω		9B5-62	BTR-1000	
R8	1000Ω		9B5-62	BTR-1000	
R9	10K		9B5-74	BTR-10K	
R10	150K		9B5-88	BTR-150K	
R11	27K			BTS-27K	Note 1
R12	5100Ω 5%		9B5-176	BTR-5100 5%	Note 2
R13	1000Ω		9B5-62	BTR-1000	
R14	12K 5%			BTR-12K 5%	Note 3
R15	560Ω		9B5-59	BTR-560	
R16	82Ω		9B1-99	BTR-82	
R17	470Ω			BTS-470	Note 4

Note 1: Some versions use 6800Ω 5% in this application (part no. 9B5-179).
Note 2: Some versions use 1000Ω in this application (part no. 9B5-62).
Note 3: Some versions use 4300Ω 5% in this application (part no. 9B5-174).
Note 4: Some versions use 200Ω 5% in this application (part no. 9B1-142)

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO INPUT)

ITEM No.	RESISTANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	RAYTHEON PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	880Ω	120Ω	12C26467				TR-13		
	Turns Ratio 4 : 1								

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	RAYTHEON PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	1.9K	19Ω	12C-26539						

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	RAYTHEON PART No.	QUAM PART No.	RCA TYPE No.	
SP1	2 3/4"	PM	19Ω	18A-26389		22281	

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	RAYTHEON PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Loopstick	.1Ω	1.1Ω	13E-26452				
L2	Osc. Coil	.7Ω	4.5Ω*	13D-26379				*Tapped ② .4Ω
L3	1st IF Trans.	1.5Ω■	.6Ω	13A-26380				■ Tapped ② .6Ω
L4	2nd IF Trans.	1.6Ω▲	2Ω	13B-26382				▲Tapped ② 1Ω

BATTERIES

ITEM No.	VOLTAGE	RAYTHEON PART No.	REPLACEMENT DATA						INSTALLATION NOTES
			EVEREADY			BURGESS			
			"A"	"B"	"A-B"	"A"	"B"	"A-B"	
M1	9V "A"	22C-26460	#246			#2N6			

CRYSTAL DIODES

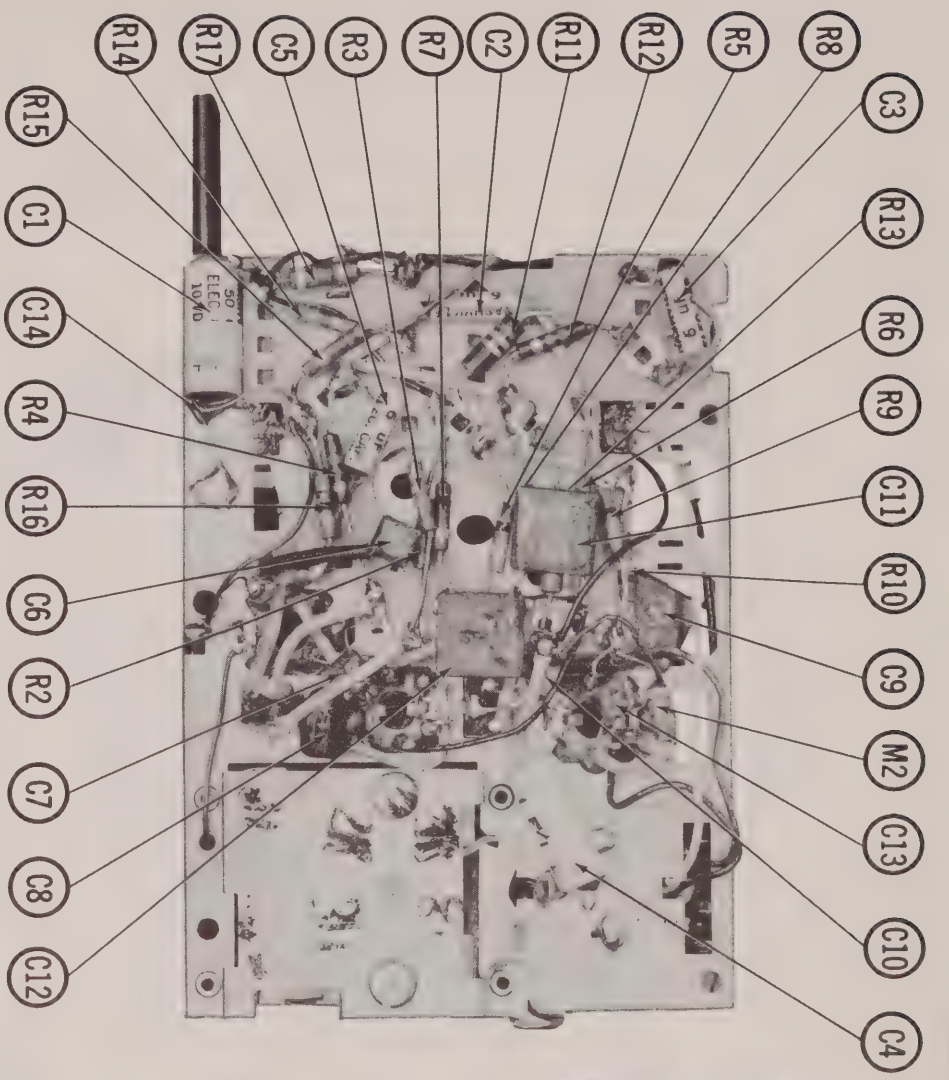
ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		RAYTHEON PART No.	SYLVANIA PART No.	
M2	1N295*	1N295 or CK-706A	1N60	Audio Det. (Pigtail)

* Some versions may use crystal diode type CK-706A in this application.

MISCELLANEOUS

ITEM No.	PART NAME	RAYTHEON PART No.	NOTES
M3	Tuning Cap.	8A-26384	2 Gang (17-190MMF, 14-120MMF)
	Case	5C-26542-A206	Models T-100-1, -2.
	Case	5C-26542-A207	Models T-100-3, -4.
	Case	5C-26542-A209	Model T-100-5.
	Case Cover	200-26448	Models T-100-1, -3.
	Case Cover	200-26448-1	Models T- 100-2, -4, -5.
	Battery Cover Assy	200-26449	Models T-100-1, -2.
	Battery Cover Assy	200-26449-1	Models T-100-3, -4.
	Battery Cover Assy	200-26449-2	Model T-100-5.
	Knob	200-26408	Tuning
	Knob	5B-26356-A206	On-Off-Volume, Models T-100-1, -2.
	Knob	5B-26356-A207	On-Off-Volume, Models T-100-3, -4.
	Knob	5B-26356-A209	On-Off-Volume, Model T-100-5.

CHASSIS—BOTTOM VIEW



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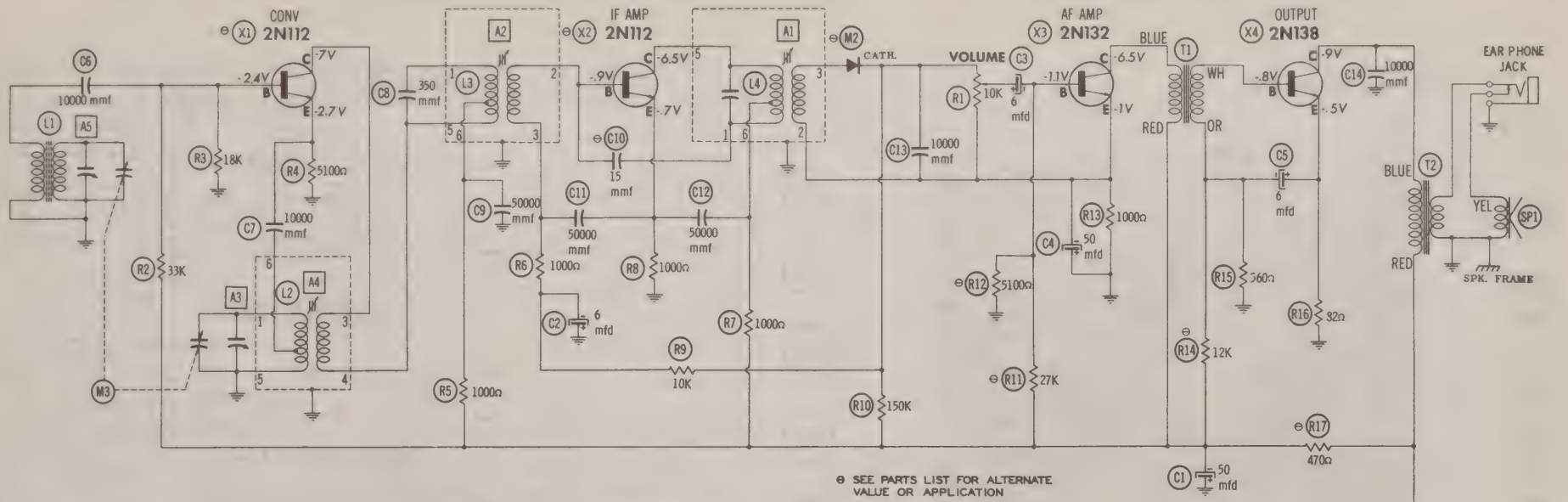
RAYTHEON MODEL T-100-1 (CH. 4RT1)



θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

IF=455KC

ITEM	TUBE	Base	Emitter	Collector
X1	2N112	2800Ω 11K	5K 1500Ω	†1300Ω
X2	2N112	1700Ω 20K	1000Ω 700Ω	†1300Ω
X3	2N132	1200Ω 4K	1000Ω 700Ω	†1200Ω
X4	2N138	500Ω	82Ω	†2200Ω

MEASURED FROM JUNCTION OF R17 AND ON-OFF SWITCH.
DUAL READINGS INDICATE REVERSAL OF METER LEADS.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
5. Volume control at maximum, no signal applied for voltage measurements.

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PHOTOFACT* Folder

*TRADE MARK

RAYTHEON MODELS UM-2186, UM-2187, UM-2188, UM-2189 (Ch. 21T32)

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RAYTHEON MODEL UM-2187

TRADE NAME	Raytheon Models UM-2186, UM-2187, UM-2188, UM-2189 (Ch. 21T32)
MANUFACTURER	Raytheon Manufacturing Co., Television & Radio Div., 5921 W. Dickens Ave., Chicago 39, Illinois
TYPE SET	Television Receiver
TUBES	Seventeen
POWER SUPPLY	105-115 Volts AC-60 Cycle RATING 1.6 Amp. @ 115 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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RAYTHEON MODELS UM-2186, UM-2187, UM-2188, UM-2189 (Ch. 21T32)

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DATE 9-56 SET 331 FOLDER 12

RAYTHEON MODELS UM-2186, UM-2187, UM-2188, UM-2189 (Ch. 21T32)

PROPERTY OF
SHIP

DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

1. Remove 8 push-on type control knobs from top panel of cabinet.

2. Remove 5 metal screws. Remove rear cover.

3. Remove 4 metal screws at the top and sides of cabinet.

4. Slide side panel strips off runners toward the rear of the cabinet.

5. Lift the top half of the cabinet straight up and off.

MODELS	CHASSIS
UM-2186, UM-2187, UM-2188, UM-2189	21T32

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removing the channel selector and fine tuning knobs.

PICTURE TUBE SAFETY GLASS CLEANING

For picture tube safety glass cleaning, it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal oscillator it is necessary to remove the rear cover and supply power to the chassis. Adjustment is located on top of the chassis. Set the horizontal hold control at the center of its range and adjust the horizontal frequency slug (L26) until the picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the buzz control located on top of chassis for maximum sound and minimum buzz.

HORIZONTAL SIZE CONTROL ADJUSTMENT

The horizontal size control is located on the neck of the picture tube in the form of a brass sleeve and slides between the yoke and picture tubes. Push sleeve into yoke to decrease size. Pull out to increase size.

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

RAYTHEON MODELS UM-2186, UM-2187, UM-2188, UM-2189 (Ch. 21T32)

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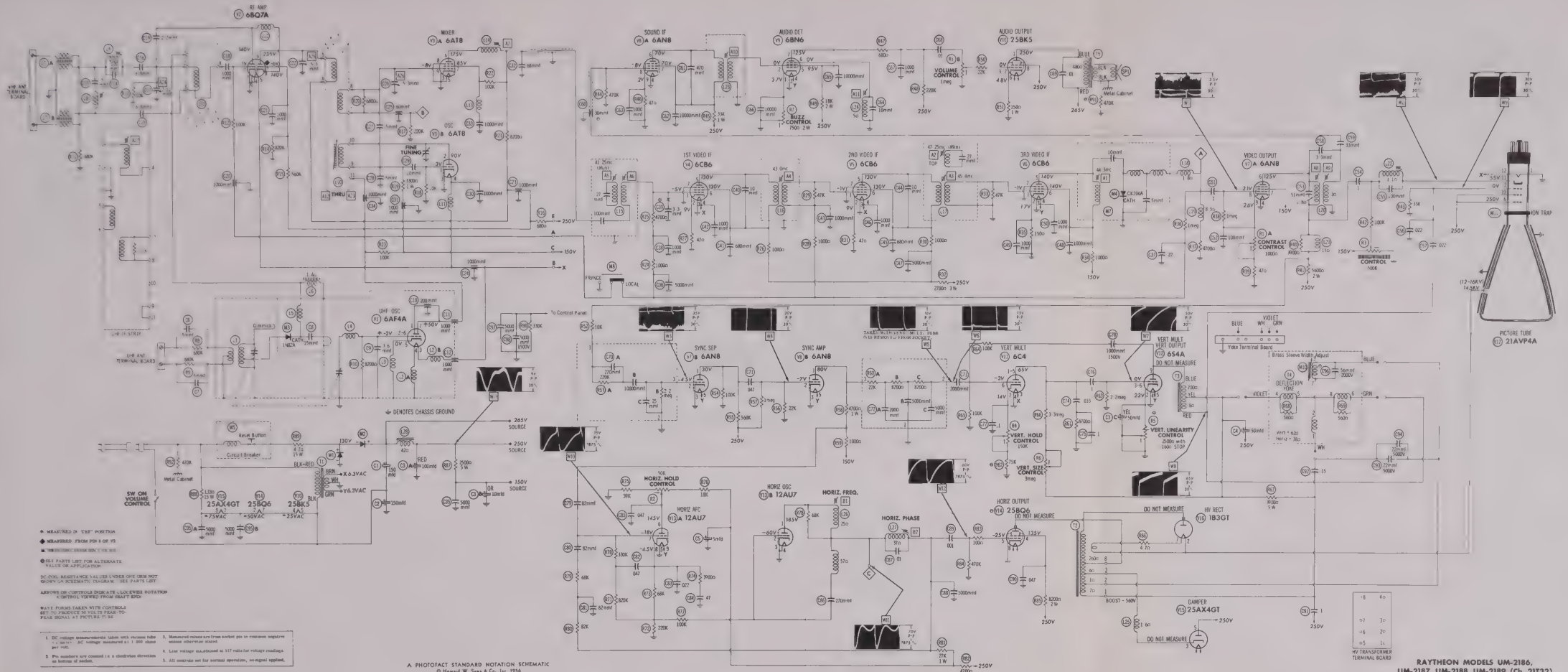
RF AMP V1 6BQ7A
MIXER V3 A 6AT8
OSC V3 B 6AT8
SOUND IF V8 A 6AN8
AUDIO DET V9 6BN6
AUDIO OUTPUT V10 25BK5
VOLUME CONTROL 1meg
BUZZ CONTROL 7500 2W
FINE TUNING
UHF OSC V1 6AF4A
UHF ANT TERMINAL BOARD
UHF STRIP
Gimmick
To Control Panel
1ST VIDEO IF V4 6CB6
2ND VIDEO IF V5 6CB6
3RD VIDEO IF V6 6CB6
VIDEO OUTPUT V7 A 6AN8
CONTRAST CONTROL 100K
BRIGHTNESS CONTROL 500K
ION TRAP
PICTURE TUBE V17 21AVP4A
112-16KV 14.5KV
FRINGE
LOCAL
SYNC SEP V1 B 6AN8
SYNC AMP V6 6AN8
VERT MULT V11 6C4
VERT MULT V12 654A
DO NOT MEASURE
VERT. LINEARITY CONTROL 2500 with 160Ω STOP
VERT. HOLD CONTROL 150K
VERT. SIZE CONTROL 3meg
Yoke Terminal Board
Brass Sleeve Width Adjust
DEFLECTION YOKE
HORIZ. HOLD CONTROL 50K
HORIZ AFC V13 A 12AU7
HORIZ OSC V13 B 12AU7
HORIZ. FREQ.
HORIZ. PHASE
HORIZ OUTPUT V14 25BQ6
HV RECT V16 1B3GT
DAMPER V15 25AX4GT
BOOST - 560V
HV TRANSFORMER TERMINAL BOARD
Reset Button
Circuit Breaker
Metal Cabinet
SW ON VOLUME CONTROL
25AX4GT 25BQ6 25BK5
+75VAC +30VAC +25VAC
X 6.3VAC
Y 6.3VAC
DENOTES CHASSIS GROUND
265V SOURCE
250V SOURCE
150V SOURCE
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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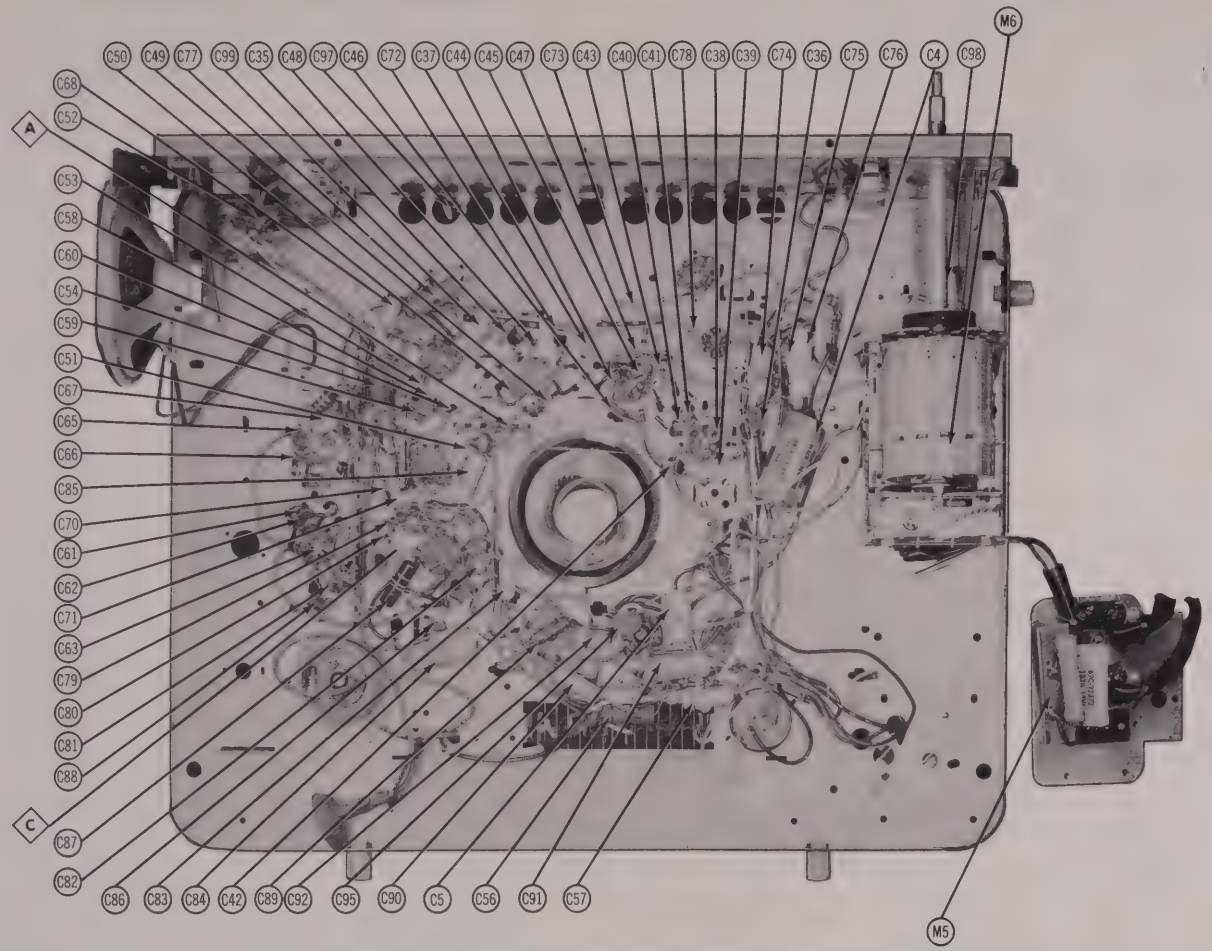
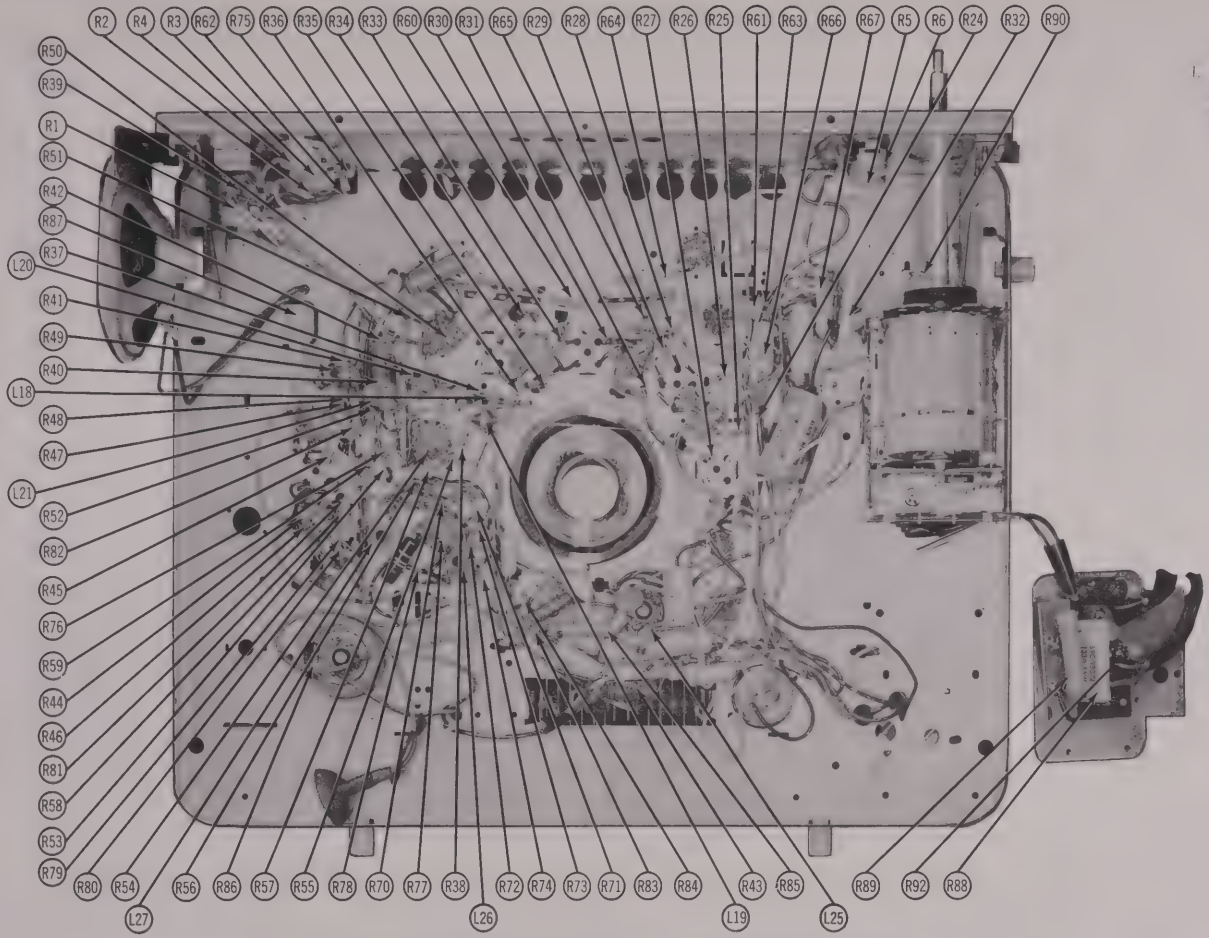
RAYTHEON MODELS UM-2186, UM-2187, UM-2188, UM-2189 (Ch. 21T32)



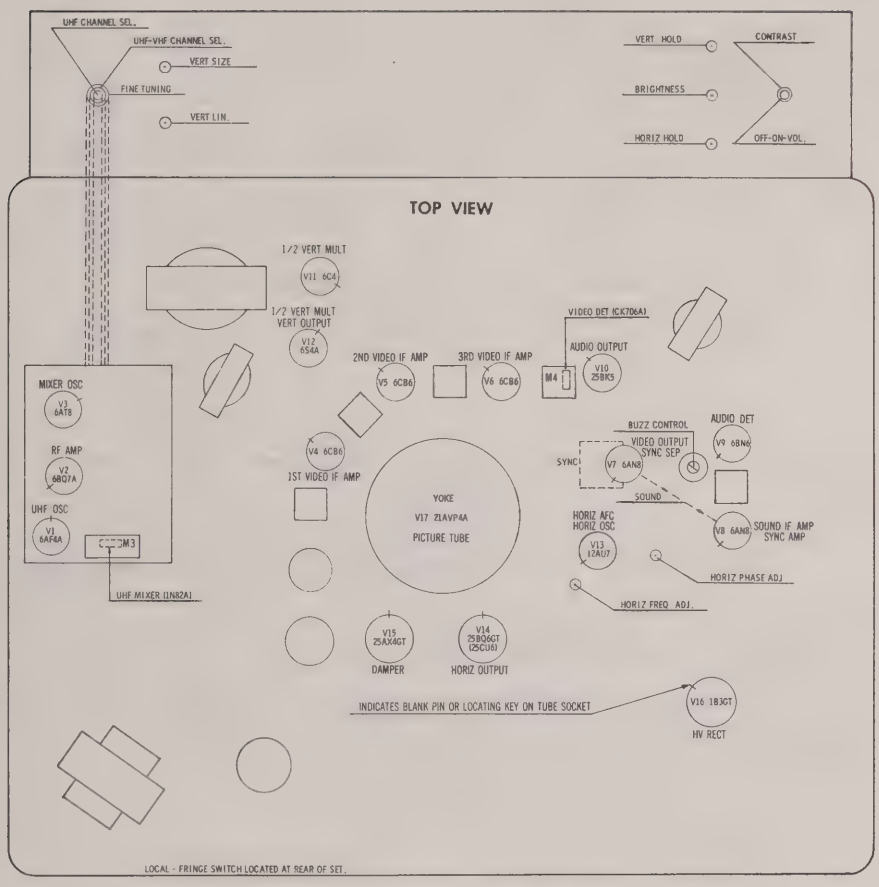
CHASSIS BOTTOM VIEW-CAPACITOR AND ALIGNMENT IDENTIFICATION



CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION

TUBE PLACEMENT CHART

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

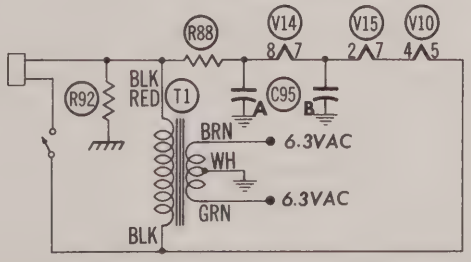
POWER SUPPLY FAILURE
No raster, no sound - **Selenium Rectifiers (M1 & M3), circuit breaker (M5)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V3, V4, V5, V6, V7 (V1 UHF only)**
No pic, no sound, has snow - **V2, V3, V4**
No pic, has sound, has raster - **V7, V17**
Has pic, no sound - **V8, V9, V10**

SYNC FAILURE
No vert. sync - **V8, V11, V12**
No horiz. sync - **V8, V13**
No vert. or horiz. sync - **V7, V8**

SWEEP FAILURE
No raster, has sound - **V13, V14, V15, V16, V17**
No vertical deflection - **V11, V12**
Poor vert. linearity or foldover - **V11, V12**
Poor horiz. linearity or foldover - **V13, V14, V15**
Narrow picture - **V13, V14, V15, V16, M1, M2**
Vert. off freq. - **V8, V11, V12**
Horiz. off freq. - **V8, V13**

NOTE: Since this receiver employs tubes used in a series-parallel filament network, an open filament in any tube in series will cause the set to be inoperative (See circuit below).



SET 331 FOLDER 12

RAYTHEON MODELS UM-2186, UM-2187, UM-2188, UM-2189 (Ch. 21T32)

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use an isolation transformer to protect the test equipment.
The high voltage lead should be securely taped away from the chassis.

VIDEO IF ALIGNMENT

Connect a .001MFD capacitor across the vertical amplifier terminals of the oscilloscope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.001MFD	High side to pin 1 (grid) of 6CB6 (V4). Low side to chassis.	Not used	44.3MC (Unmod)	10	USE VTVM. DC probe to point (A). Common to chassis.	A1	Attenuate signal generator to maintain not more than 2 volts at VTVM. Adjust for maximum deflection.
2.	"	"	"	47.25MC	"	"	A2	Adjust for MINIMUM deflection.
3.	"	"	"	45.4MC	"	"	A3	Attenuate signal generator to maintain not more than 2 volts at VTVM. Adjust for maximum deflection.
4.	"	"	"	43.0MC	"	"	A4	"
5.	"	"	43.5MC (10MC Swp)	42.5MC 45.6MC	"	Vert. Amp. thru 10K to point (A). Low side to chassis.		Use only enough sweep generator output to provide usable pattern on scope. Check for response curve similar to Fig. 1. If necessary, retouch A1, A3 and A4 for desired response. Adjust A1 for MINIMUM tilt. A3 affects high frequency side of response curve. A4 affects low frequency side of curve.
6.	Direct	High side to ungrounded tube shield floating over converter tube. Low side to chassis.	Not used	41.25MC	"	USE VTVM. DC probe to point (A). Common to chassis.	A5	Adjust for MINIMUM deflection.
7.	"	"	43.5MC (10MC Swp)	42.5MC 45.6MC	"	Vert. Amp. thru 10K to point (A). Low side to chassis.	A6, A7	Adjust A6 and A7 for response similar to Fig. 2. If necessary, SLIGHTLY retouch A1 for MINIMUM tilt, A3 for position of 45.6MC marker and A4 for position of 42.5MC marker.

SOUND IF ALIGNMENT

Restore the receiver to normal operating condition. Tune in a TV signal and adjust the fine tuning control until sound bars just appear in the picture. Adjust A8 slug counter clockwise from the coil turns. Then clockwise until the scanning lines are smooth and continuous. Readjust the fine tuning for the clearest picture and best sound.
Insert an attenuator in series with the antenna and the receiver antenna terminals so that the signal strength may be varied from weak to strong. If a suitable attenuator is not available, stray feed the signal to the receiver by placing the antenna lead-in near the antenna terminals. Reduce the signal input to the receiver so that the signal falls below the limiting level of the 6BN6 as evidenced by a hiss in the sound. Adjust the secondary of the sound take-off transformer (A9), the sound IF transformer (A10), The quadrature coil (A11) and the buzz control (R7) for maximum sound and minimum buzz. If the hiss disappears while adjusting, increase attenuation until hiss reappears.

VHF OSCILLATOR ALIGNMENT

Connect the negative lead of a 1. 5 volt bias battery to the tuner AGC. Connect the positive lead to chassis.
The channel oscillator adjustment screws are reached through a hole just above the channel switch shaft. The correct adjustment screw is accessible through this hole as the channel switch is turned to each channel.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 10K to point (A). Low side to chassis.	A12	Adjust to place sound marker in trap notch as in Fig. 3. Video marker should fall at 50%.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A13	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A14	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A15	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A16	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A17	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A18	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A19	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A20	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A21	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A22	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A23	

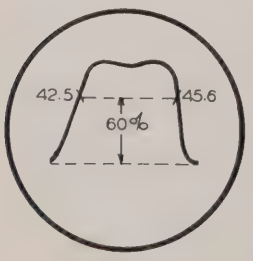


FIG.1

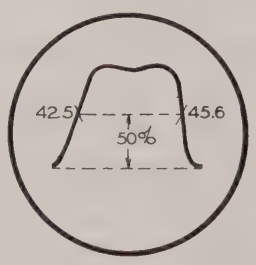


FIG.2

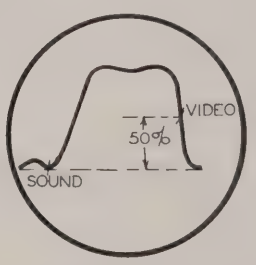


FIG.3

ALIGNMENT INSTRUCTIONS (cont)

VHF RF AND MIXER ALIGNMENT

Connect the bias as under "VHF Oscillator Alignment".
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp)	205.25MC 209.75MC	12	Vert. Amp. thru 10K to point (B). Low side to chassis.	A24, A25 A26	Adjust for response curve similar to Fig. 4 with markers above 90%.
11.	"	"	213MC (10MC Swp)	211.25MC 215.75MC	13	"		Check for response similar to Fig. 4. If markers fall below 70% on any channel, make compromise adjustments of A24, A25 and A26 with channel switch set to that channel. Check all other channels to see that they have not been seriously affected.
			201MC (10MC Swp)	199.25MC 203.75MC	11			
			195MC (10MC Swp)	193.25MC 197.75MC	10			
			189MC (10MC Swp)	187.25MC 191.75MC	9			
			183MC (10MC Swp)	181.25MC 185.75MC	8			
			177MC (10MC Swp)	175.25MC 179.75MC	7			
			85MC (10MC Swp)	83.25MC 87.75MC	6			
			79MC (10MC Swp)	77.25MC 81.75MC	5			
			69MC (10MC Swp)	67.25MC 71.75MC	4			
			63MC (10MC Swp)	61.25MC 65.75MC	3			
			57MC (10MC Swp)	55.25MC 59.75MC	2			

UHF TUNER ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
12.	Two 120Ω Carbon Resistors	Across UHF antenna terminals with 120Ω in each lead.	600MC (10MC Swp)	Not used	35	Vert. Amp. thru 10K to point (A). Low side to chassis.	A27	Use only enough sweep generator output to provide usable pattern on scope. Adjust A27 for response similar to Fig. 5.
13.	"	"	470MC (10MC Swp)	"	14	"		Response curve should have tilt similar to Fig. 6.
14.	"	"	870MC (10MC Swp)	"	80	"		Response curve tilt should be similar to Fig. 7. Tilts on response curves in steps 12 and 13 should be approximately equal. If not, retouch A27 until they are.

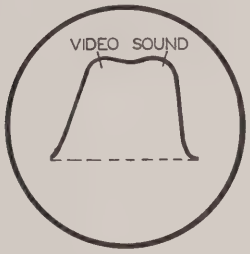


FIG. 4

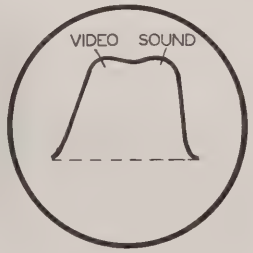


FIG. 5

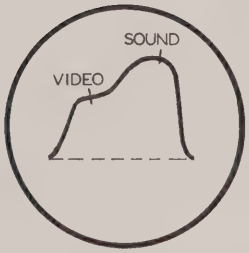


FIG. 6

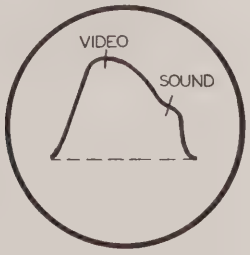
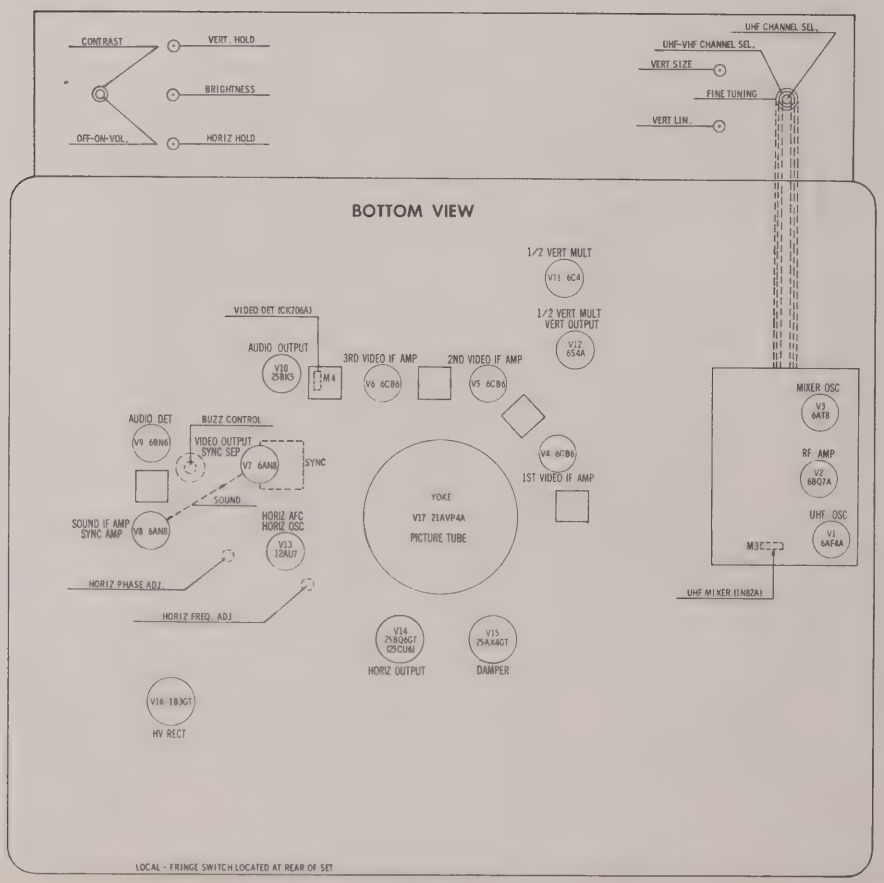


FIG. 7

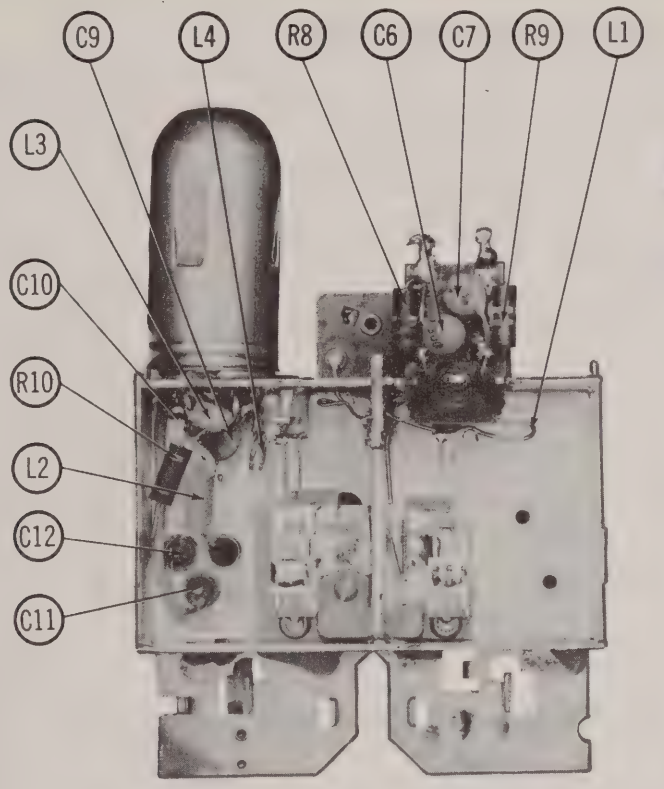
RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6AF4A	*† 5800Ω	8200Ω	.1Ω	0Ω	0Ω	8200Ω	*† 5800Ω		
V2	6BQ7A	INF	1Meg	0Ω	0Ω	.1Ω	† 700Ω	350KΩ	INF	0Ω
V3	6AT8	10K	† 5800Ω	0Ω	.1Ω	0Ω	† 9000Ω	† 100K	0Ω	220K
V4	6CB6	1Meg	47Ω	0Ω	.1Ω	† 3700Ω	† 3700Ω	0Ω		
V5	6CB6	1Meg	47Ω	0Ω	.1Ω	† 3700Ω	† 3700Ω	0Ω		
V6	6CB6	.1Ω	150Ω	0Ω	.1Ω	† 3500Ω	† 3500Ω	0Ω		
V7	6AN8	† 110K	2.2Meg	0Ω	0Ω	.1Ω	† 5600Ω	† 2500Ω	1Meg	100Ω
V8	6AN8	† 8200Ω	22K	0Ω	0Ω	1Ω	† 33K	† 33K	470K	47Ω
V9	6BN6	350Ω	.4Ω	0Ω	.1Ω	† 18K	5Ω	† 220K		
V10	25BK5	† 480Ω	TP	270K	#10Ω	#0Ω	150Ω	270K	† 42Ω	TP
V11	6C4	▲ 4Meg	NC	.1Ω	0Ω	▲ 4Meg	100K	100K		
V12	6S4A	NC	1000Ω	2.2Meg	0Ω	.1Ω	2.2Meg	NC	NC	▲ 4500Ω
V13	12AU7	† 30K	300K	0Ω	0Ω	0Ω	† 30K	1.2Meg	280K	.1Ω
V14	25BQ6	TP	#18Ω	TP	† 8200Ω	470K	TP	#10Ω	0Ω	TOP CAP ▲ 7.6Ω
V15	25AX4GT	TP	NC	500K	NC	† 42Ω	TP	#18Ω	#25Ω	
V16	1B3GT		PINS	1 - 8	HAVE	INF	RESISTANCE			TOP CAP ▲ 267Ω
V17	21AVP4A	0Ω	33K	PIN 6 † 42Ω	PIN 10 † 42Ω	PIN 11 † 250K	PIN 12 .1Ω			

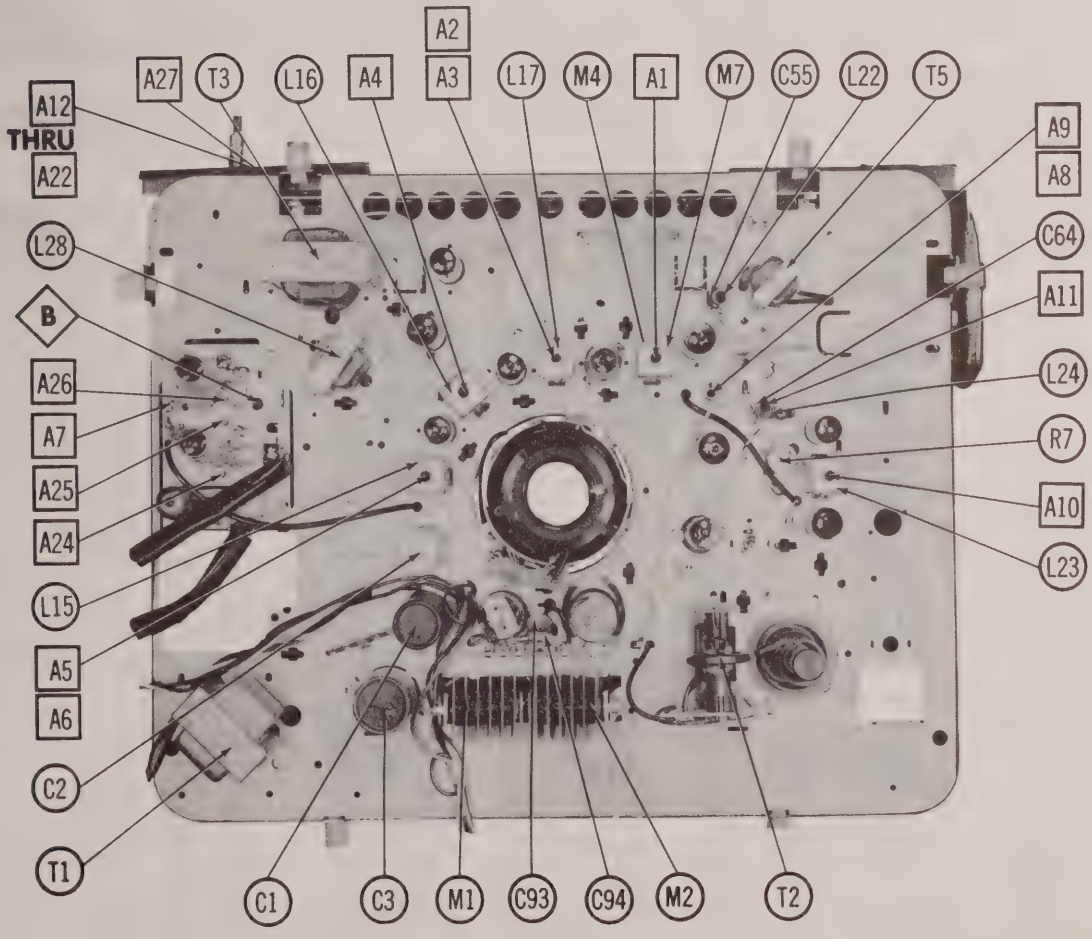
* MEASURED IN "UHF" POSITION.
† MEASURED FROM OUTPUT OF M2.
# MEASURED FROM PIN 5 OF V10.
▲ MEASURED FROM PIN 3 OF V15.
TP TIE POINT
NC NO CONNECTION.



TUBE PLACEMENT CHART



UHF TUNER FRONT VIEW



CHASSIS TOP VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No	USE	TYPE	NOTES
V1	UHF Oscillator	6AF4A	
V2	RF Amplifier	6BQ7A	
V3	Mixer-Oscillator	6A7S	
V4	1st Video-IF Amplifier	6CB6	
V5	2nd Video-IF Amplifier	6CB6	
V6	3rd Video-IF Amplifier	6CB6	
V7	Video Output-Sync Sep	6AN8	
V8	Sound IF-Sync Amp	6AN8	
V9	Audio Detector	6BH6	
V10	Audio Output	35B5	
V11	Vert. Mult.	6C4	
V12	Vert. Mult.-Vert. Output	6S4A	
V13	Horiz AFC-Horiz Osc	12AU7	
V14	Horiz. Output	25W6	Note 1
V15	Damper	1N3A4GT	
V16	HV Rectifier	1B3GT	

Note 1. 25CU6 may be used in some versions.

PICTURE TUBE

ITEM No	REPLACEMENT DATA: RAYTHEON PART No.	SYLVANIA PART No.	NOTES
V17	21AVP4A ①	21AVP4A ①	① Aluminized
		21AVP4A B ①	② Silver screen "85"
	21AVP4	21AVP4A B ②	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING: CAP	VOLT	REPLACEMENT DATA: RAYTHEON PART No.	AEROVOX PART No.	CORNELL DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	150	150	BC-22464	AFH2L-70	XA004	FP1J7	TMS-25	T-050	TVL-1428
C2	150	150	BC-22463	AFH2L-70	XA004	FP1J7	TMS-25	T-050	TVL-1428
C3A	100	300	BC-25308	RE1042	D002	WQ535	TMT-175	T-526	TVL-3574
B	10	300			BR505			TWV-1060	
C	50	50							
C4	50	350	BC-33533	PR8350V50	BR5035	TC79	TD-50-450	FM-4550	TVA-1713
C5	5	300	BC-24174	PR8350V4	BR435	TC60	TD-8-350	FM-3508	TVA-1601

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP	VOLT	REPLACEMENT DATA: RAYTHEON PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C6	5		1006-34349							
C7	5		1006-34349							
C8	15		1075-33749	NPO-D15	TCZ-15	Z031	NP0E-150		5TCC-Q15	
C9	3.6		1075-25750							
C10	3.6		1075-25751							
C11	1000		1075-25752							
C12	1000		1075-25753							
C13	5		1075-25754							
C14	120		1075-33741	D1-00013	DD-121	T232	811-121	UC-5312	5CA-T12	
C15	6.8		1075-25739	NPO-D15.6	TCZ-6R8	Z013	NP0A-6R8	ZT-5568	5TCCB-V68	
C16	6.8		1075-25739	NPO-D15.6	TCZ-6R8	Z013	NP0A-6R8	ZT-5568	5TCCB-V68	
C17	3-10				ADV-10					
C18	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C19	2.2		1075-25747	NPO-S22.2	TCZ-2R2	Z006	NP0A-2R2		5TCCB-V22	
C20	1000		1075-25748							
C21	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C22	3-3		[illegible]		S29-3		3139-01-5R5	C7565A		
C23	1000		1075-25743							
C24	1000		1075-25742							
C25	60		[illegible]							
C26	5-3		[illegible]		S29-3		3139-01-5R5	C7565A		
C27	5		1075-25744		TCZ-5R5	TZ01	NP0A-5R5			
C28	5		[illegible]							
C29	10		1075-25746							
C30	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C31	1000		1075-25742							
C32	68			N750-D168	TCN-68	N038	N750L-680		5TCU-Q68	
C33	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C34	1000		1075-25743							
C35	5000			BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C36	5000			BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C37	.3	200		P388N-3	TCZ-3R3	CUSP23		PT4022	2TM-P32	
C38	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C39	3.3			NP0-d33	TCZ-3R3	Z006	NP0A-3R3	ZT-5533	5TCCB-V33	Note 1
C40	10			N750-d10	TCN-10	N018	N750A-100	NT-541	5TCU-Q1	
C41	680			SE680	DE-681	TP50	GP2K-681	UC-5368	5GA-T68	
C42	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C43	[illegible]			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C44	[illegible]			N750-d10	TCN-10	TN01	N750A-100	NT-541	5TCU-Q	
C45	680			SE680	DE-681	TP50	GP2K-681	UC-5368	5GA-T68	
C46	1000			SD200	DE-102	TP52	GP2L-102	UC-531	5GA-D1	
C47	[illegible]			BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C48	[illegible]			SD200	DE-102	TP52	GP2L-102	UC-531	5GA-D1	
C49	[illegible]			SD200	DE-102	TP52	GP2L-102	UC-531	5GA-D1	
C50	[illegible]			SD200	DE-102	TP52	GP2L-102	UC-531	5GA-D1	
C51	.1	200		P388N-1	DF-104	CUSP21		PT401	2TM-P1	
C52	[illegible]			SD100	DE-101	TZ30	GP1K-101	UC-531	5GA-T1	
C53	51									
C54	.1	400		P488N-1	DF-104	CUB4P1		PT401	4TM-P1	
C55	.1			NP0-d210	DE-101		801-101	MC-8235	5HK-D1	
C56	.056	200		BPD-02	DF-103	CUB4S32	817-02	PT4122	2TM-S22	
C57	.023	600		BPD-02	DF-103	CUB4S23	817-02	PT8123	6TM-S23	
C58	3.3			NP0-d33	TCZ-3R3	TZ06	NP0A-3R3	ZT-5533	5TCCB-V33	
C59	33			NP0-d133	TCZ-33	TZ18	NP0L-330	ZT-5433	5TCC-Q33	Note 3
C60	39		143B-23173							
C61	470			1484-00047	DE-471	SR5T47	811-471		DC-512	5EK-D1
C62	10000			BPD-01	DD-103	K082	811-01		DC-541	5HK-D1
C63	1000			BPD-001	DD-102	K069	801-001		DC-521	5HK-D1
C64	10			NP0-d10	TCZ-10	TZ09	NP0A-100		ZT-541	5TCC-Q1
C65	5600			BPD-01	DD-103	K082	811-01		DC-541	5HK-D1
C66	5600			BPD-01	DD-103	K082	811-01		DC-541	5HK-D1
C67	[illegible]			BPD-001	DD-102	K069	801-001		DC-521	5HK-D1
C68	.05	600		BPD-05	DD-503	CUB4S1	GP3-533-103		PT501	6TM-S1
C69	.01	600		BPD-01	DD-103	CUB4S1	GP3-533-103		PT501	6TM-S1
C70A	270						T241		811-271	UC-5327	5GA-T27
B	10000		?17A-34323	?PA-535	?PC-265	[illegible]	K082		811-01	DC-512	5HK-S1
C	125						T235		831-259	UC-5425	5GA-Q25
C71	.047	300		BPD-05	DF-203	CUB2S47			PT4147	2TM-S47	
C72A	[illegible]								DC-532		MS-23
B	[illegible]		47A-33270	47PA-120	47PC-100	41J15TM1	41495-01		DC-525		4V-1
C	[illegible]								DC-525		
C73	[illegible]			1484-002							MS-23
C74	.033	600		BPD-03	DF-303	CUB6S33			PT4133		6TM-S33
C75	.1	200		P388N-1	DF-104	CUB2P1			PT401		2TM-P1

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No	RATING: CAP	VOLT	REPLACEMENT DATA: RAYTHEON PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C76	.1	400		P488N-1	DF-104	CU84P1		PT401	4TM-P1	
C77	.1	300		P388N-1	DF-104	CUB2P1		PT401	2TM-P1	
C78	1000	1500	SQ-24991	HVD-15-1000	DD30-102	MCD1	1R5KV-102	DC3021	20GA-D1	
C79	82			1469-00082	TCZ-82	Z040	801-820		MS-482	
C80	82			1469-00082	TCZ-82	Z040	801-820		MS-482	
C81	82			1469-00082	TCZ-82	Z040	801-820		MS-482	
C82	.047	300		BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C83	.022	200		BPD-02	DF-303	CUB4S22	817-02	PT4122	2TM-S22	
C84	.47	300		P388N-47		CUB2P47		PT4047	2TM-P47	
C85	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C86	270			NP0-d270	TCZ-270	TZ15	811-271		MS-427	
C87	.01	600								
C88	1000			1484-001		1R5D1	811-102	MC8265	MS-21	
C89	.001	600		BPD-001	D6-102	CUB6D1	GP2L-102	PT601	6TM-D1	
C90	.047	400		BPD-05	DF-503	CU84S47		PT4147	4TM-S47	
C91	.1	100		P388N-1	DF-104	CU84P1		PT401	4TM-P1	
C92	.15	200		P388N-15		CUB2P15		PT4015	2TM-P15	
C93	22	5000	SQ-24719	HVD-50-22		V5Q22	5KV-220	DC30422	50GA-Q22	
C94	22	5000	SQ-24719	HVD-50-22		V5Q22	5KV-220	DC30422	50GA-Q22	
C95A	5000			BPD-2X0047	DD2-502	DK079	811-005	DC-525	5HK-D47	
B	5000						811-005	DC-525		
C96	56	2000				DD30-560	3KV-560	DC30456		Note 2
C97	5000			BPD-005		DD30-502	K080	811-005	5HK-D5	
C98	5000	1500		HVD-15-4700	DD15-502	V2D5	1R5KV-472	DC30215	30HK-D5	

Note 1. Not used in some versions.
Note 2. Some versions may use 68MMF unit (part #SC-34709) in this application.
Note 3. C60 is capacity sound IF coupling lead.
† Items C79A, C79B, C79C, R53A and R53B are combined in one unit.
* Items C74A, C75B, C76C, R60A, R60B and R60C are combined in one unit.

CONTROLS

ITEM No	RATING: RESISTANCE	WATTS	REPLACEMENT DATA: RAYTHEON PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1000Ω		B10A-23714	F1-4	RTV-486	*Q2-734	UP13L	Contrast (Panel)
B	1Meg			R2-52			UR6A	Volume (Rear)
C	Switch			KB-1			UB-26	Attach to R1A
R2A	10K		B10B-23694	AB-31	A47-50K-d	Q11-123	TA56L	Horiz. Hold
B	Shaft		Not Req.	AK-19	RN-3	TQ	Not Req.	Attach to R2A
R3A	100K		B10B-23695	AB-59	A47-100K-d	Q11-133	TA55L	Brightness
B	Shaft		Not Req.	AK-4	KS8-3	Not Req.	Not Req.	Attach to R3A
R4A	150K		B10B-23693-1	AB-43	A47-150K-S	Q11-232	TA104L	Vert. Hold
B	Shaft		Not Req.	AK-4	KS8-3	Not Req.	Not Req.	Attach to R4A
R5A	2500Ω		B10B-23606	*AB-7	*A47-2500-d	*Q11-112	*8U-8	Vert. Linearity
	with 1600Ω stop							
B	Shaft		Not Req.	AK-1	FKB-1/2	SQ	Not Req.	Attach to R5A
R6A	1Meg	‡	B10B-23696	AB-84	A47-1Meg-S	Q11-140	TA56L	Vert. Size
B	Shaft		Not Req.	AK-1	FKB-1/2	NQ	Not Req.	Attach to R6A
R7	750Ω	2	A10D-23657		75-750			Buzz (Wire-wound)

* Concentrikit Equivalent: K-6 Kit, Base Elements & Shafts, R1T-108 & P17-102 (Panel)
R2-137 & R2-125 (Rear)
16-1 Switch
† Universal replacement (Mallory exact duplicate part #UR56D).
‡ Connect a 180Ω resistor in series with the right hand terminal of the control and the lead connecting to the same terminal of the original control (control viewed from shaft end, terminals down).

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No	RATING: OHMS	WATT	REPLACEMENT DATA: RAYTHEON PART No.	IRC PART No.	NOTES
R6	680K		BTB-680K		
R9	680K		BTB-680K		
R10	820Ω				
R11	680K		BTB-680K		
R12	100K		BTB-100K		
R13	10K		BTB-10K		
R14	820K		BTB-820K		
R15	560K		BTB-560K		
R16	680Ω		BTB-680		
R17	330K		BTB-330K		
R18	10K		BTB-10K		
R19	3300Ω	1	BTA-3300		
R20	6800Ω		BTB-6800		
R21	330Ω		BTB-3300		
R22	100K		GP2L-102	UC-531	5GA-D1
R23	10K		BTB-10K		
R24	1000Ω		BTB-1000		
R25	4700Ω		GP2L-102	UC-531	5GA-D1
R26	1000Ω		BTB-1000		
R27	47Ω		BTB-47		
R28	1000Ω		BTB-1000		
R29	47K				
R30	1000Ω		BTB-1000		
R31	47Ω		BTB-47		
R32	2700Ω	3	9C11-1104		
R33	47K				
R34	1000Ω		BTB-1000		
R35	15Ω		BTB-150		
R36	1Meg		BTB-1Meg		
R37	4700Ω		BTB-4700		
R38	1Meg		BTB-1Meg		
R39	47Ω		BTB-47		
R40	3900Ω		BTB-3900		
R41	5600Ω	2	BTB-5600		
R42	100K		BTB-100K		
R43	33K		BTB-33K		
R44	470K		BTB-470K		
R45	33K	1	BTA-33K		
R46	47Ω		BTB-47		
R47	680Ω		BTB-680		
R48	330K		BTB-330K		
R49	18K	2	BTB-18K		
R50	33K		BTB-33K		
R51	150Ω	1	BTA-150		

ITEM No	RATING: OHMS	WATT	REPLACEMENT DATA: RAYTHEON PART No.	IRC PART No.	NOTES
R52	10K		BTB-10K		
R53A	120Ω		?17A-34212	[illegible]	
B	2.2Meg			[illegible]	
R54	100K		BTB-100K		
R55	560K		BTB-560K		
R56	22K		BTB-22K		
R57	1Meg		BTB-1Meg		
R58	4700Ω	1	BTA-4700		
R59	1000Ω		BTB-1000		
R60A	33K		BTB-33K		
B	6300Ω		?17A-33276	[illegible]	
C	6300Ω			[illegible]	
R61	4700Ω		BTB-4700		
R62	75K 5%		BTB-75K 5%		Note 1
R63	2.2Meg		BTB-2.2Meg		
R64	100K		BTB-100K		
R65	100K		BTB-100K		
R66	3.3Meg		BTB-3.3Meg		
R67	1900Ω	6	PW7-1900		
R68	560Ω				
R69	560Ω				
R70	330K				
R71	820K				
R72	220K				
R73	68K				
R74	3900Ω				
R75	100K		BTB-100K		
R76	18K				
R77	100K				
R78	68K				
R79	68K				
R80	62K				
R81	27K	1			
R82	4700Ω		BTA-27K		
R83	100Ω		BTB-4700		
R84	470K		BTB-100		
R85	8200Ω	3			
R86	6.7Ω		9C1-1071		
R87	3500Ω	5	PW3-6.7		
R88	133Ω	15	9C-34633		
R89	4.7Ω	15	9C-33573		
R90	330K		9C-25669		
R91	470K		BTB-330K		
R93	470K		BTB-470K		
			BTB-470K		

† Items R53A, R53B, C70A, C70B, C70C are combined in one unit.
* Items R60A, R60B, R60C, C72A, C72B, C72C are combined in one unit.
Note 1. Some versions use a 68K resistor in this application.
Note 2. Not used in some versions.

TRANSFORMER (POWER)

ITEM No	RATING: PRI	SEC. 1	SEC. 2	SEC. 3	REPLACEMENT DATA: RAYTHEON PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	115VAC	12VCT			12D-22699-3	F8S36 ①	P-3969	P-8130	21F97	
	②-.30A	②2.1A								

① Drill new mounting holes.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No	USE	REPLACEMENT DATA: RAYTHEON PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	Horiz. Output Trans.	12E-25040	F3648 *	HVO-58 *		X136 *		FLY-60 *	D-83 *
T3	Vert. Output Trans.	12E-19048-2	21900-②	A-3038 ②	122T1 ③	V3068 ②	A-8143 ②	26S53 ②	A-99X ②
T4A	Yoke-Horiz. (24MM)	30L-34633 ①	DF868 ⑦	MDF-75 ⑦	2332D ⑦	V7078 ⑦	DY-18A ⑦	Y-10 ⑦ ⑧	Y-19-1 ⑦
B	Vert. (42MM)	16M-34493 ①		⑦ ⑧	⑤ ⑦	⑦ ⑧	⑦ ⑧		⑦ ⑧

① Use 10 to 1 turns ratio.
② Connect as auto transformer.
③ Drill new mounting hole(s).
④ Includes capacitor C96, resistors R88 and R89.
⑤ Yoke rear cover and centering device.
⑥ Requires new centering device.
⑦ Loosen and rotate core clamp to duplicate original mounting.
⑧ Connect horizontal yoke damping network across terminals #3 and #7.
⑨ Use original horizontal yoke damping network if necessary.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
8	8	8		8	8	8	8
3	3	6		6	6	3	
2	3	6		5	6	3	
1	2	2		3	2	2	3

TRANSFORMER (AUDIO OUTPUT)

ITEM No	IMPEDANCE: PRI	SEC	REPLACEMENT DATA: RAYTHEON PART No.	Halldorson PART No.	Merit PART No	Stancor PART No	Thordarson PART No	Triad PART No
T5	6.6KΩ	3-4Ω	13C-23704-1	Z1113	A-3026	A-3878	24H80	S-7X

SPEAKER

ITEM No.	RATINGS: SIZE	FIELD	V. C. IMP	REPLACEMENT DATA: RAYTHEON PART No.	QUAM PART No.	RCA TYPE No	NOTES
SP1	5"	PM	3-4Ω	18A-24682	5A97	20S83	

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: RAYTHEON PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	UHF RF Coil	0Ω		107B-35761				
L2A	Fil. Choke	0Ω		107B-35768				
B	Fil.Choke	0Ω						
L3	Cathode Choke	0Ω		107B-35765				
L4	UHF Osc. Coupling Coil	0Ω		107B-35764				
L5	UHF IF Coil	0Ω		107B-35763				
L6	UHF IF Coil	1.4Ω		107B-35762				
L7A	VHF Ant. Match. Trans.	0Ω	0Ω	107B-35754				
B	VHF Ant. Match. Trans.	0Ω	0Ω	107B-35754				
L8	IF Trap	.2Ω		107B-35757				
L9	IF Trap	.2Ω		107B-35756				
L10A	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-35755-3				Channel 2
B	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-35755-3				Channel 3
C	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-35755-4				Channel 4
D	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-35755-5				Channel 5
E	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-35755-6				Channel 6
F	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-35755-7				Channel 7
G	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-35755-8				Channel 8
H	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-35755-9				Channel 9
I	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-35755-10				Channel 10
J	VHF Ant. RF Mixer Grid & Osc. Coils	0Ω		107B-35755-11				Channel 11
K	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-35755-12				Channel 12
L	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω		107B-35755-13				Channel 13
M	UHF IF Coils	0Ω		107B-35760				
L11	Fil. Choke	0Ω		107B-35767				
L12	Next. Coil	0Ω		105B-35255				
L13	RF Coil	0Ω		107B-35758				
L14	Conv. Plate	.1Ω		107B-35759				

RAYTHEON MODELS UM-2186, UM-2187, UM-2188, UM-2189 (Ch. 21T32)

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	RAYTHEON PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L15	1st. Video IF			13A-24203				Includes 41.25MC trap
L16	2nd. Video IF	.1Ω	.1Ω	13A-24224	17-5001 *	TV-125 *	6231 *	
L17	3rd. Video IF	.1Ω	.1Ω	13A-24937	17-5003 *	TV-128 *	6233 *	Includes 47.25MC trap
L18	Series Peaking Coil	1.8Ω		16A-22427	19-1004		4610	7.5 Microhenries
L19	Shunt Peaking Coil	8.5Ω		16A-21391			6155	305 Microhenries
L20A	4.5MC Trap	1.8Ω		201-23729				
B	1st. Sound IF	3Ω						
L21	Shunt Peaking Coil	15Ω		16A-24375			6156	770 Microhenries
L22	4.5MC Trap	1.1Ω		16A-25441				
L23	2nd. Sound IF	.4Ω	.4Ω	201-23873				
L24	Quadrature Coil	5Ω		201-23727			1480	
L25	RF Choke	1.6Ω		16A-21701	19-1005		4612	8 Microhenries

* Cut out chassis hole and use adaptor plate.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES.		REPLACEMENT DATA							NOTES
	PRI.	SEC.	RAYTHEON PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	RCA TYPE No.	Ram PART No.	Thordarson PART No.	
L26	62Ω		201-24472			6212				Horiz. Osc. - tapped @57Ω
L27	37Ω		201-24473			6314				Horiz. Stab.

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA					
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ~)	RAYTHEON PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L28	.250A	42Ω	.6 HY	16A-24655	C5037 ①		C2328 ①	26C44 ①	C-23X①

① Drill one new mounting hole.

SELENIUM RECTIFIER

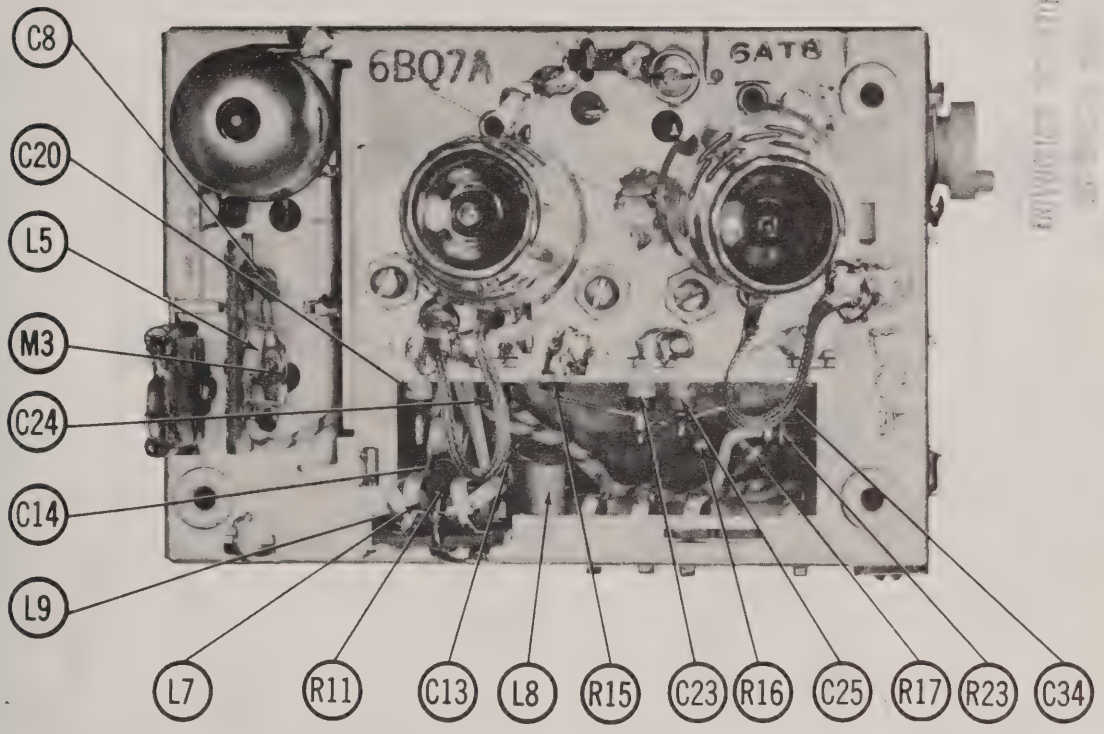
ITEM No.	RATING	REPLACEMENT DATA						NOTES
	CURRENT	RAYTHEON PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	
M1	.280A	21J-20097	1236A	MR300	6S300	6Q4	300	
M2	.280A	21J-20097	1236A	MR300	6S300	6Q4	300	

CRYSTAL DIODES

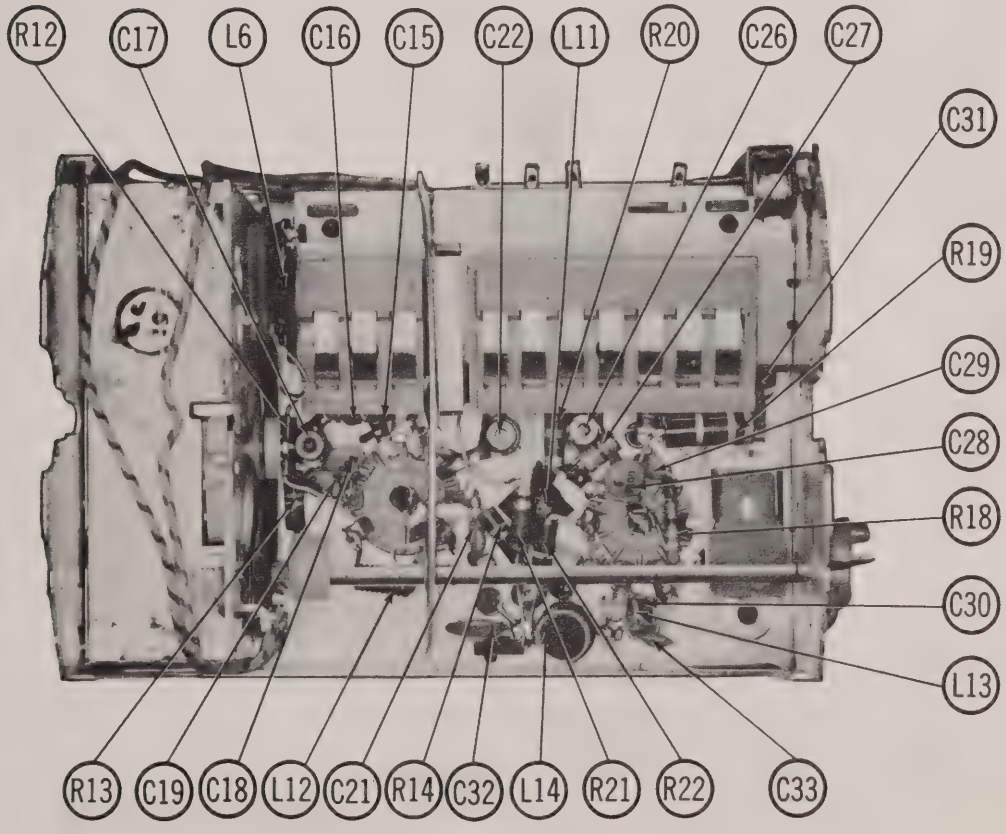
ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		RAYTHEON PART No.	SYLVANIA PART No.	
M3	1N82A	31K-111	1N82 or 1N82A	UHF Mixer (Clip in)
M4	CK706A		1N60	Video Detector (Pigtail)

MISCELLANEOUS

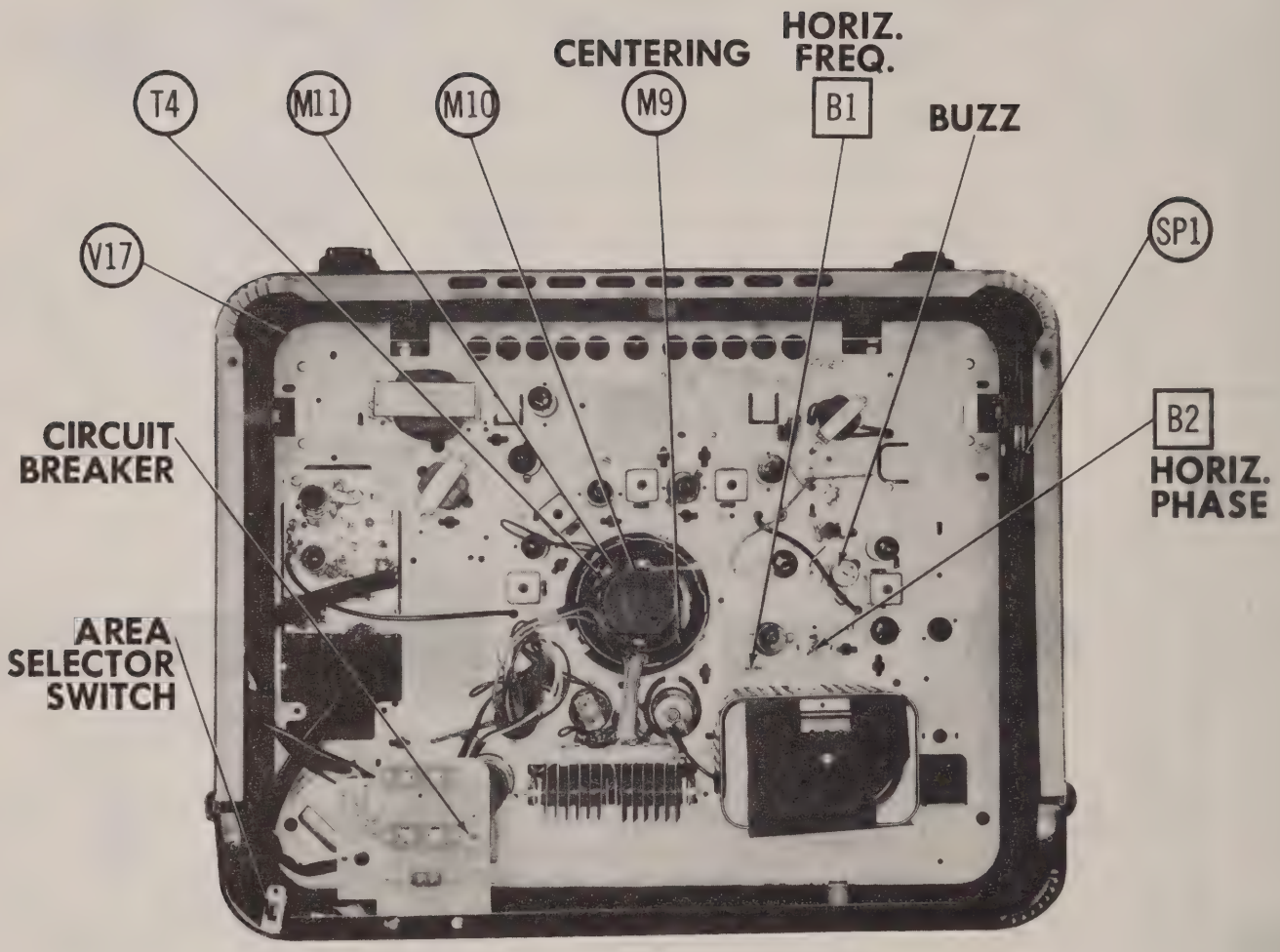
ITEM No.	PART NAME	RAYTHEON PART No.	NOTES
M5	Circuit Breaker	20F-25568	Low Voltage protection
M6	Tuner	21I-25394	VHF-UHF combination
M7	Video Det. Assy.	13B-24206	Includes M4, coils and capacitors
M8	Switch	201-24479	AGC (SPDT-Slide type)
M9	Centering Device	16M-24493	Includes deflection yoke (T4) Rear cover
M10	Width Control	2C-25229	
M11	Ion Trap	16M-19706	
	Case	2B-24662-A184	Top-Model UM-2186
	Case	2B-24662-A185	Top -Model UM-2187
	Case	2B-24662-A186	Top-Model UM-2188
	Case	2B-24662-A148	Top-Model UM-2189
	Case	2B-24660-A168	Bottom - All models
	Knob	5B-25415-A93	Fine tuning
	Knob	5B-25414-A93	VHF Station Selector
	Knob	5B-25417-A93	UHF Indicator
	Knob	5B-25426-A93	Picture
	Knob	5B-25432-A93	On-off-volume
	Knob	5B-23839-A93	Control
	Mask	25M-24593-A199	Model UM-2186
	Mask	25M-24593-A198	Model UM-2187
	Mask	25M-24593-A200	Models UM-2188, UM-2189
	Safety Glass	30M-24909	



RF TUNER-TOP VIEW



RF TUNER-BOTTOM VIEW



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably with a test pattern.

Turn the horizontal hold control (R2) to its mid-range position.

Connect a short clip lead across L27. Adjust the horizontal frequency slug (B1) until the picture synchronizes horizontally. Remove clip lead from L27. Connect the vertical amplifier of the oscilloscope thru a low capacity probe to point Ⓒ. Low side to chassis.

Adjust the horizontal phase slug (B2) until a waveform similar to Fig. 8 is obtained. While making this adjustment, keep picture in sync with the horizontal hold and B1. Remove the scope connection. Turn R2 fully counter clockwise and then fully clockwise. The picture should fall out of sync at both extreme settings of R2.

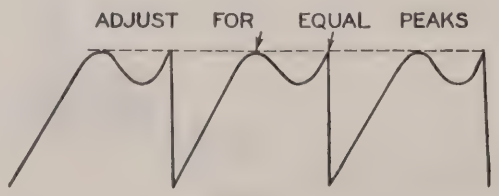
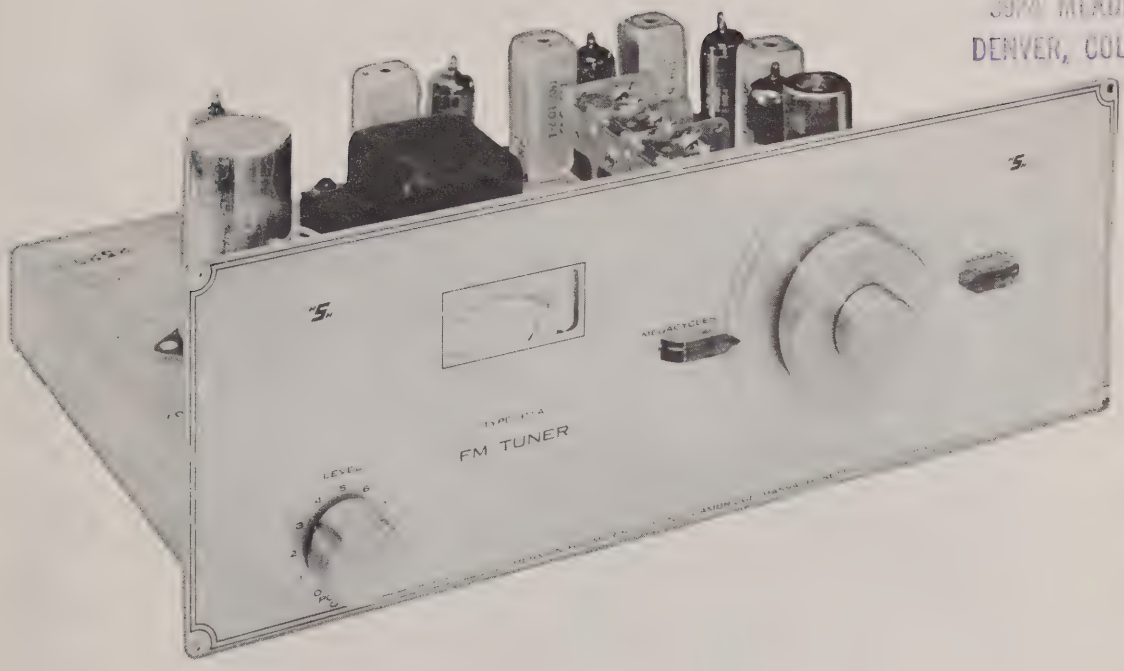


FIG. 8

L. F. BLANKENSHIP
3944 MEADE ST.
DENVER, COLORADO

H. H. SCOTT
MODEL 311-A



H. H. SCOTT
MODEL 311-A

TRADE NAME	H. H. Scott Model 311-A		
MANUFACTURER	Hermon Hosmer Scott, Inc., 385 Putnam Ave., Cambridge 39, Mass.		
TYPE SET	AC Operated FM Superheterodyne Tuner		
TUBES (Seven)	Types 6BQ7A RF Amplifier, 6U8 Mixer-Oscillator, 6AU6 1st IF Amplifier, 6AU6 2nd IF Amplifier, 6AU6 Limiter, 12AU7 (or) 12AX7 AF Amplifier, 6X4 Rectifier		
POWER SUPPLY	105-125 Volts AC - 60 Cycles		
TUNING RANGE—	FM- 88MC - 108MC	RATING	.32 Amp. @ 117 Volts AC

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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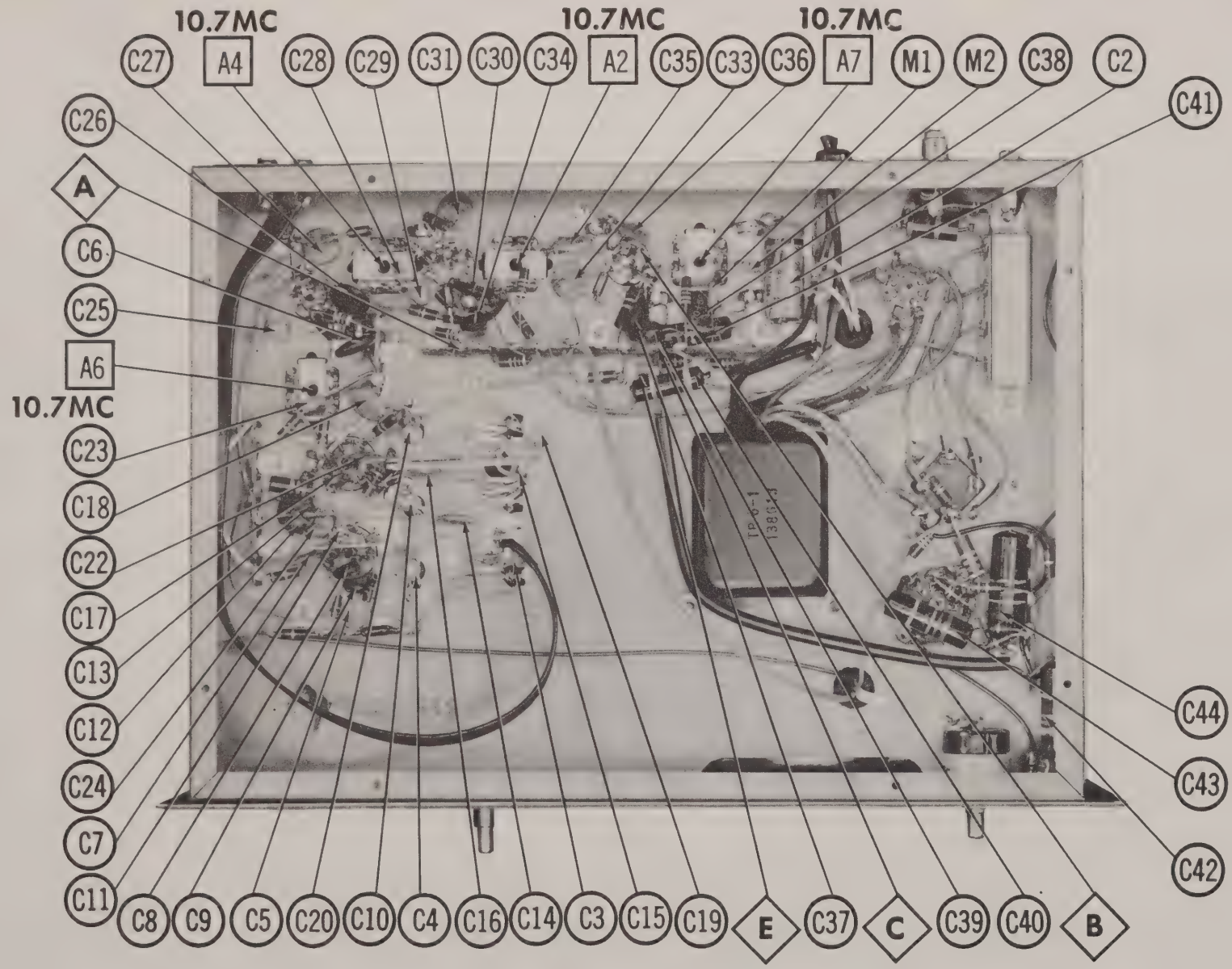
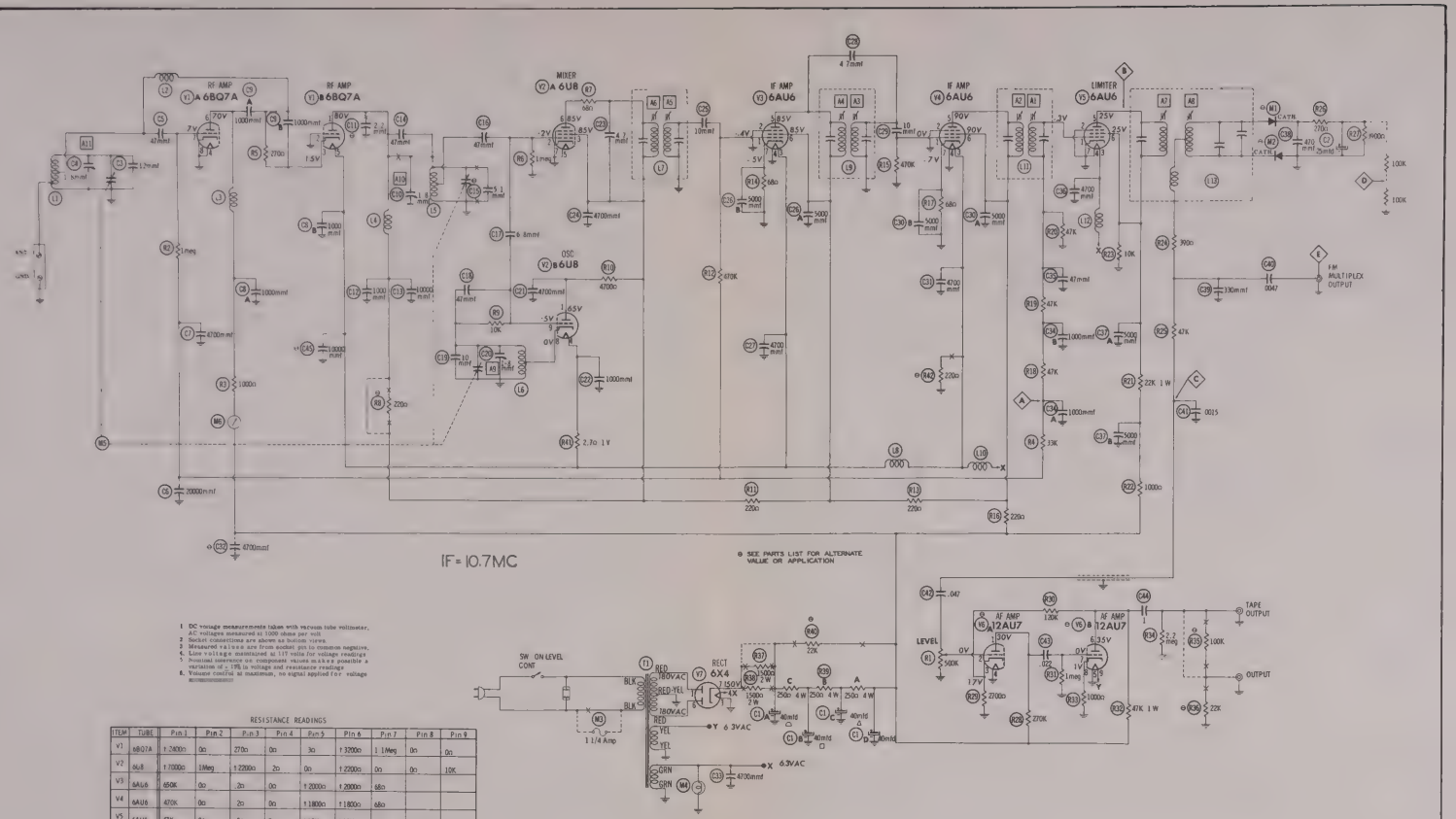


CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION



1. DC voltage measurements taken with vacuum tube voltmeter.
   AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage readings.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BQ7A	†.2400Ω	0Ω	270Ω	0Ω	3Ω	†.3200Ω	1.1Meg	0Ω	0Ω
V2	6U8	†.7000Ω	1Meg	†.2200Ω	2Ω	0Ω	†.2200Ω	0Ω	0Ω	10K
V3	6AU6	650K	0Ω	2Ω	0Ω	†.2000Ω	†.2000Ω	68Ω		
V4	6AU6	470K	0Ω	2Ω	0Ω	†.1800Ω	†.1800Ω	68Ω		
V5	6AU6	47K	0Ω	2Ω	0Ω	†.15K	†.15K	0Ω		
V6	12AU7	†.270K	500K	2700Ω	0Ω	0Ω	†.40K	1Meg	1000Ω	
V7	6X4	180Ω	NC	0Ω	2Ω	NC	160Ω	10K		

† MEASURED FROM PIN 7 OF V7.
NC NO CONNECTION

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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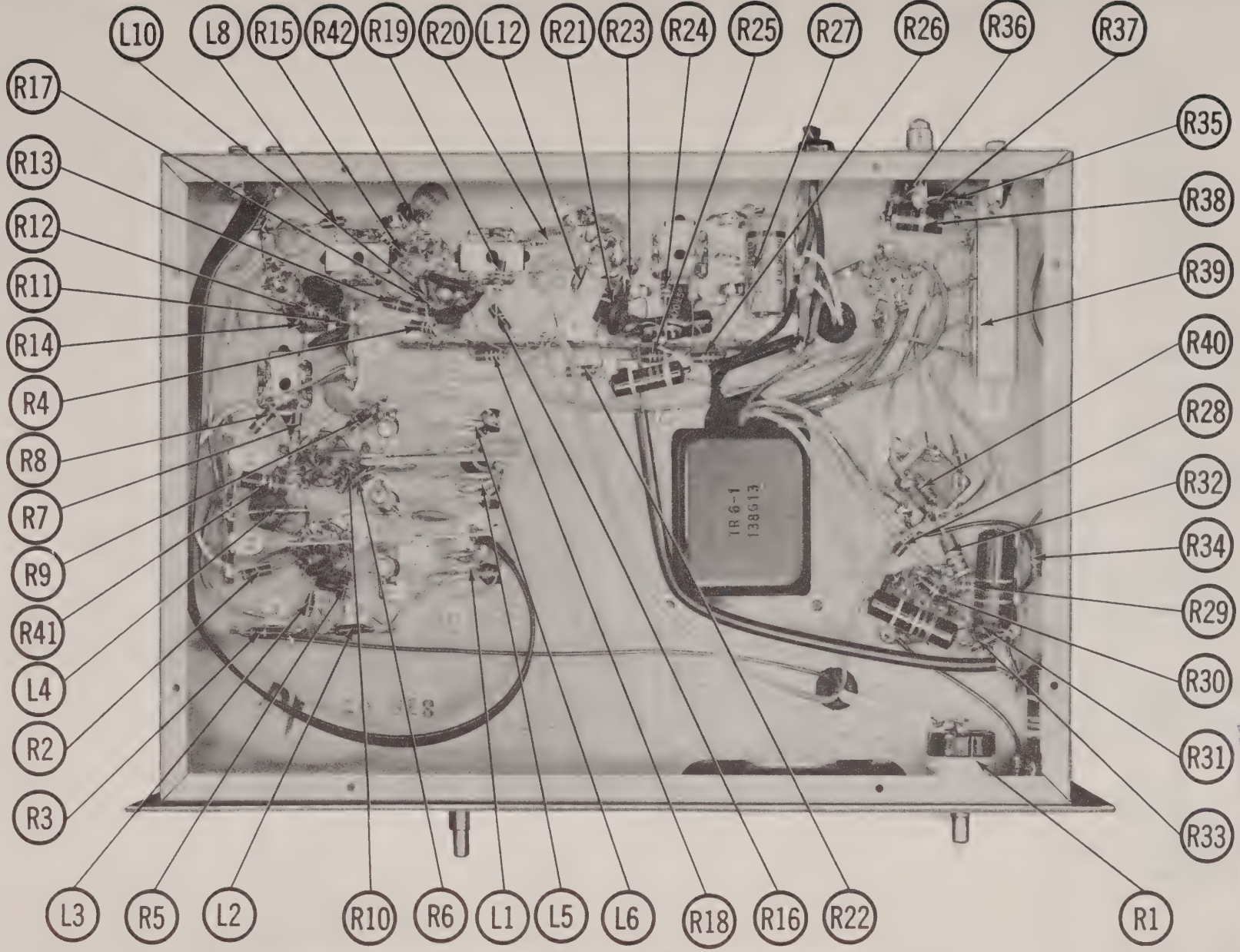


CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

H. H. SCOTT
MODEL 311-A

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting. Level control extreme clockwise.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect 2 matched 100K resistors in series at junction of C2 and R26. The junction of these two resistors is alignment point (D) as shown on schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1.		Clip high side to body of 47MM off pin 2 (grid) of 6U8 (V2). Low side to chassis.	10. 7MC (unmod)	109MC	DC probe to point (A). Common to chassis.	A1, A2, A3, A4, A5, A6	Connect 5MFD paper capacitor across C6. Adjust for maximum deflection. Remove 5MFD capacitor.
2.	.01MFD	High side to pin 1 (grid) of 6AU6 (V5). Low side to chassis.	"	"	RF probe loosely coupled to point (B). Common to chassis.	A7	Connect 1000Ω resistor across L13 secondary. Adjust primary (A7) for maximum deflection. Remove 1K shunt
3.	"	"	"	"	DC probe to point (C). Common to point (D).	A8	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 500KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
1.		Clip high side to body of 47MMF off pin 2 (grid) of 6U8 (V2). Low side to chassis.	10. 7MC (500KC Swp)	109MC	Vert. amp. to point (A). Low side to chassis.	A1, A2, A3, A4, A5, A6	Disconnect stabilizing capacitor (C2). Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
2.	.01MFD	High side to pin 1 (grid) of 6AU6 (V5). Low side to chassis.	"	"	Vert. amp. to point (B). Low side to chassis.	A7	"
3.	"	"	"	"	Vert. amp. to point (C). Low side to point (D).	A8	Reconnect stabilizing capacitor (C2). Adjust so that 10. 7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A7 for maximum amplitude and straightness of crossover lines.

RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4.	270Ω carbon resistor	High side thru 270Ω to antenna. Low side to chassis.	106MC (unmod)	106MC	AC probe to point (E). Common to chassis.	A9, A10, A11	Adjust for maximum deflection.
5.	"	"	92MC	92MC	"	L1, L5, L6	Adjust by expanding or compressing coil turns for maximum deflection. Repeat step 4.

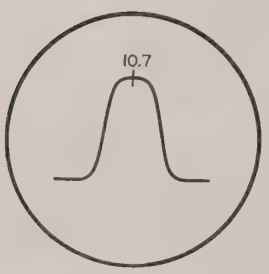


FIG. 1

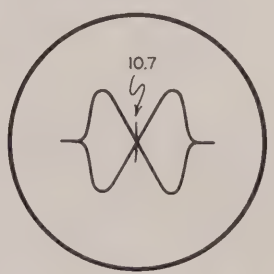


FIG. 2

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amplifier	6BQ7A	
V2	Mixer-Oscillator	6U8	
V3	1st IF Amplifier	6AU6	
V4	2nd IF Amplifier	6AU6	
V5	Limiter	6AU6	
V6	AF Amplifier	12AU7	Note 1
V7	Rectifier	6X4	

Note 1: Some versions may use 12AX7 in this application.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA H. H. SCOTT PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲40	200		AFH4-01-60			TMQ116	Q-210 MTD-4540	R1149*
B	■40	200							
C	▲40	200							
D	40	200							
C2	25	25		PRS25V25	BBR25-25	TC26	TD-25-25	FM-0225	TVA-1205

* Non catalog item.

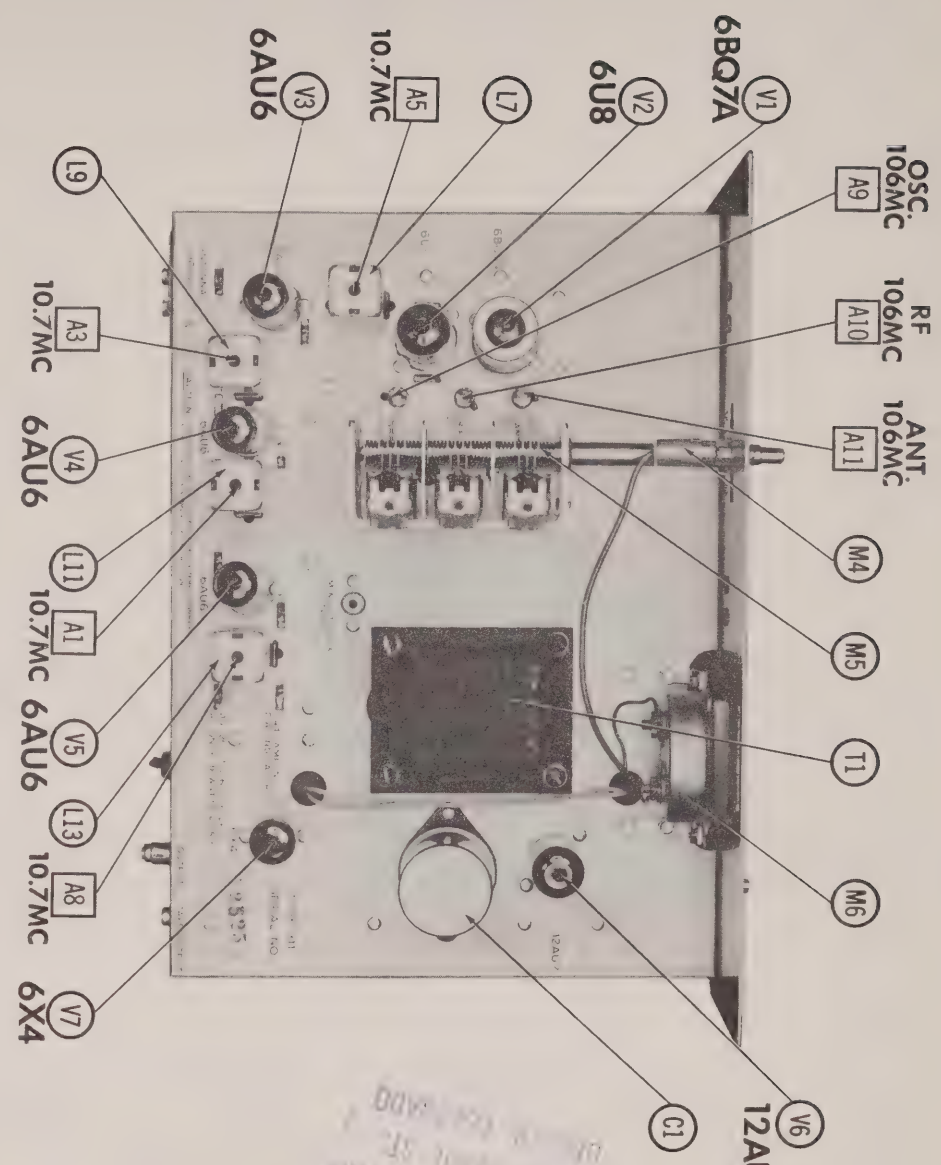
FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA H. H. SCOTT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C3	12				TCZ-12					
C4	1-8									
C5	47			BPD-000047	DD-470	G033	831-470	UC-5447	5GA-Q47	
C6	20000			BPD-02	DF-203	K085	817-02	PT412	5HK-S2	
C7	4700			BPD-0047	DD-472	K079	811-0047	DC525	5HK-D47	
C8A	1000			BPD-2X001	DD2-102	DK069	812-001	DCD521	5HK-2D1	
B	1000									
C9A	1000			BPD-2X001	DD2-102	DK069	812-001	DCD521	5HK-2D1	
B	1000									
C10	1-8									
C11	2.2			NP0-SI2.2	TCZ-2R2	TZ05	NP0A-2R2		5TCCB-V22	Note 1
C12	1000			BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C13	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C14	47			BPD-000047	DD-470	G033	831-470	UC-5447	5GA-Q47	
C15	5.1			NP0-SI5	TCZ-4R7	TZ07	NP0A-050	ZT-555	5TCCB-V47	Note 1
C16	47			NP0-DI47	TCZ-47	Z033	NP0-338-470	ZT-5447	5TCC-Q47	
C17	6.8			NP0-SI6.8	TCZ-6R8	TZ08	NP0A-6R8	ZT-5568	5TCCB-V68	
C18	47			NP0-DI47	TCZ-47	Z033	NP0-338-470	ZT-5447	5TCC-Q47	
C19	10			N750-DI10	TCN-10	N018	N750A-100	NT-541	5TCU-Q1	
C20	1-8									
C21	4700			BPD-0047	DD-472	K079	811-0047	DC525	5HK-D47	
C22	1000			BPD-01	DD-102	K069	801-001	DC521	5HK-D1	
C23	4.7			NP0-SI4.7	TCZ-4R7	TZ07	NP0A-4R7	ZT-5547	5TCCB-V47	
C24	4700			BPD-0047	DD-472	K079	811-0047	DC525	5HK-D5	
C25	10			NP0-DI10	TCZ-10	Z018	NP0A-100	ZT-541	5TCC-Q1	
C26A	5000			BPD-2X005	DD2-502	DK079	811-005	DC525	5HK-2D47	
B	5000						811-005	DC525		
C27	4700			BPD-0047	DD-472	K079	811-0047	DC525	5HK-D47	
C28	4.7			NP0-SI4.7	TCZ-4R7	TZ07	NP0A-4R7	ZT-5547	5TCCB-V47	
C29	10			NP0-DI10	TCZ-10	Z018	NP0A-100	ZT-541	5TCC-Q1	
C30A	5000			BPD-2X005	DD2-502	DK079	811-005	DCD525	5HK-2D47	
B	5000						811-005			
C31	4700			BPD-0047	DD-472	K079	811-0047	DC525	5HK-D47	
C32	4700			BPD-0047	DD-472	K079	811-0047	DC525	5HK-D47	Note 1
C33	4700			BPD-0047	DD-472	K079	811-0047	DC525	5HK-D47	
C34A	1000			BPD-2X001	DD2-102	DK069	812-001	DCD521	5HK-2D1	
B	1000									
C35	47			BPD-000047	DD-470	G033	831-470	UC-5447	5GA-Q47	
C36	4700			BPD-0047	DD-472	K079	811-0047	DC525	5HK-D47	
C37A	5000			BPD-2X005	DD2-502	DK079	811-005	DC525	5HK-2D47	
B	5000						811-005	DC525		
C38	470			1464-00047	DD-471	5R5T47	811-471		MS-347	
C39	330			1469-00033	DD-331	5R5T33	811-331		MS-333	
C40	.0047	400		BPD-0047	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C41	.0015	400		1464-0015		1R5D15	811-152	MCB456	MS-215	
C42	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C43	.022	400		BPD-02	DF-203	CUB4S22	817-02	PT4122	4TM-S22	
C44	.1	400		P488N-1	DF-104	CUB4P1		PT401	4TM-P1	
C45	10000			BPD-01	DD-103	K082	811-01	DC511	5HK-S1	Note 1

Note 1: Not used in some versions.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	H. H. SCOTT PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	500K	½	RCV-500K-3SW	AB-60	A47-500K-Z	Q13-133	U-48	Level
B	Shaft		Not Req.	AK-9	RS-2	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	KB-1	SWE-12	76-1	US-26	Attach to R1A

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	H. H. SCOTT PART No.	IRC PART No.	
R2	1Meg			BTS-1Meg	
R3	1000Ω			BTS-1000	
R4	33K			BTS-33K	
R5	270Ω			BTS-270	
R6	1Meg			BTS-1Meg	
R7	68Ω			BTS-68	
R8	220Ω			BTS-220	Note 1
R9	10K			BTS-10K	
R10	4700Ω			BTS-4700	
R11	220Ω			BTS-220	
R12	470K			BTS-470K	
R13	220Ω			BTS-220	
R14	68Ω			BTS-68	
R15	470K			BTS-470K	
R16	220Ω			BTS-220	
R17	68Ω			BTS-68	
R18	47K			BTS-47K	
R19	47K			BTS-47K	
R20	47K			BTS-47K	
R21	22K	1		BTA-22K	
R22	1000Ω			BTS-1000	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	H. H. SCOTT PART No.	IRC PART No.	
R23	10K			BTS-10K	
R24	390Ω			BTS-390	
R25	47K			BTS-47K	
R26	270Ω			BTS-270	
R27	3900Ω			BTS-3900	
R28	270K			BTS-270K	
R29	2700Ω			BTS-2700	
R30	120K			BTS-120K	
R31	1Meg			BTS-1Meg	
R32	47K	1		BTA-47K	
R33	1000Ω			BTS-1000	
R34	2.2Meg			BTS-2.2Meg	
R35	100K			BTS-100K	Note 1
R36	22K			BTS-22K	Note 1
R37	1500Ω	2		BTB-1500	Note 1
R38	1500Ω	2		BTB-1500	Note 1
R39A	250Ω	4		PW4-250	
B	250Ω	4		PW4-250	
C	250Ω	4		PW4-250	
R40	22K			BTS-22K	Note 1
R41	2.7Ω	1		BW1-2.7	
R42	220Ω			BTS-220	Note 1

Note 1: Not used in some versions.

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	H. H. SCOTT PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC ⓖ. 32A	340VCT ⓖ. 45A	5VAC ⓖ. 6A	6.3VAC ⓖ 2.5A	TR-6-1					

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	H. H. SCOTT PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Coil	0Ω						Tapped
L2	RF Choke	.1Ω			19-1000		4602	1 Microhenry
L3	RF Choke	.1Ω						.33 Microhenries
L4	RF Choke	.1Ω			19-1000		4602	1 Microhenry
L5	RF Coil	0Ω						Tapped
L6	Osc. Coil	0Ω						Tapped
L7	1st IF Trans.	.8Ω	.8Ω	TRV-10.7-1	16-3487	FM-254	1463	
L8	Fil. Choke	.1Ω			19-1000		4602	1 Microhenry
L9	2nd IF Trans.	.8Ω	.8Ω	TRV-10.7-1	16-3487	FM-254	1463	
L10	Fil. Choke	.1Ω			19-1000		4602	1 Microhenry
L11	3rd IF Trans.	.8Ω	.8Ω	TRV-10.7-1	16-3487	FM-254	1463	
L12	Fil. Choke	.1Ω			19-1000		4602	1 Microhenry
L13	Ratio Det.	1.5Ω	.8ΩCT	TRV-10.7D	17-3498	FM-255	1465	Tertiary winding=.5Ω

PARTS LIST AND DESCRIPTIONS (Continued)

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		H. H. SCOTT PART No.	SYLVANIA PART No.	
M1	1N295*		1N34A	Ratio Det. (Pigtail)
M2	1N295*		1N34A	Ratio Det. (Pigtail)

* Some versions may use crystal diode type CK-705A in this application.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			H. H. SCOTT PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M3		1 1/4A						

MISCELLANEOUS

ITEM No.	PART NAME	H. H. SCOTT PART No.	NOTES
M4	Pilot Light	CAV-3X16-P1	#44--Some versions may use #47 bulb in this application.
M5	Tuning Cap.		3 Gang
M6	Meter		Tuning

TRAV-LER MODELS 621-20U, -21U, -22U, -25U, -26U (Ch. 421E5, 421G5, 421M6)

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TRAV-LER MODEL 621-20U (Ch. 421M6)

TRADE NAME	Trav-Ler Models 621-20U, 621-21U, 621-22U, 621-25U, 621-26U (Ch. 421E5, 421G5, 421M6)
MANUFACTURER	Trav-Ler Radio & Television Corp., 571 W. Jackson Blvd., Chicago 6, Illinois
TYPE SET	Television Receiver
TUBES	Twenty-one
POWER SUPPLY	110-120 Volts AC-60 Cycle RATING 1.8 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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TRAV-LER MODELS 621-20U, -21U, -22U, -25U, -26U (Ch. 421E5, 421G5, 421M6)

MODELS — CHASSIS

621-20U, 621-21U, 621-22U, 621-25U, 621-26U 421E5, 421G5, 421M6

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 8 push-on type control knobs from front panel of cabinet.

2. Remove 8 wood screws and 3 metal screws. Remove rear cover.

3. Remove picture tube socket, HV lead, yoke plug and speaker leads.

4. Remove 3 wood screws. Remove chassis with mounting board.

5. Remove 4 bolts. Remove mounting board.

6. Remove 8 speaker nuts. Remove 2 speakers.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removing the channel selector and fine tuning knobs.

PICTURE TUBE SAFETY GLASS CLEANING

For picture tube safety glass cleaning, it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horizontal oscillator (L9) can be made from the rear panel of the chassis. L9 is used as the horizontal hold control. Adjust L9 until picture synchronizes horizontally. Check by switching off channel and back again.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (A10) located on top of chassis.

FUSES

Two fuses are used. One for horizontal sweep circuit protection and one for LV power supply protection. (For location, see tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

TRAV-LER MODELS 621-20U, -21U, -22U, -25U, -26U (Ch. 421E5, 421G5, 421M6)

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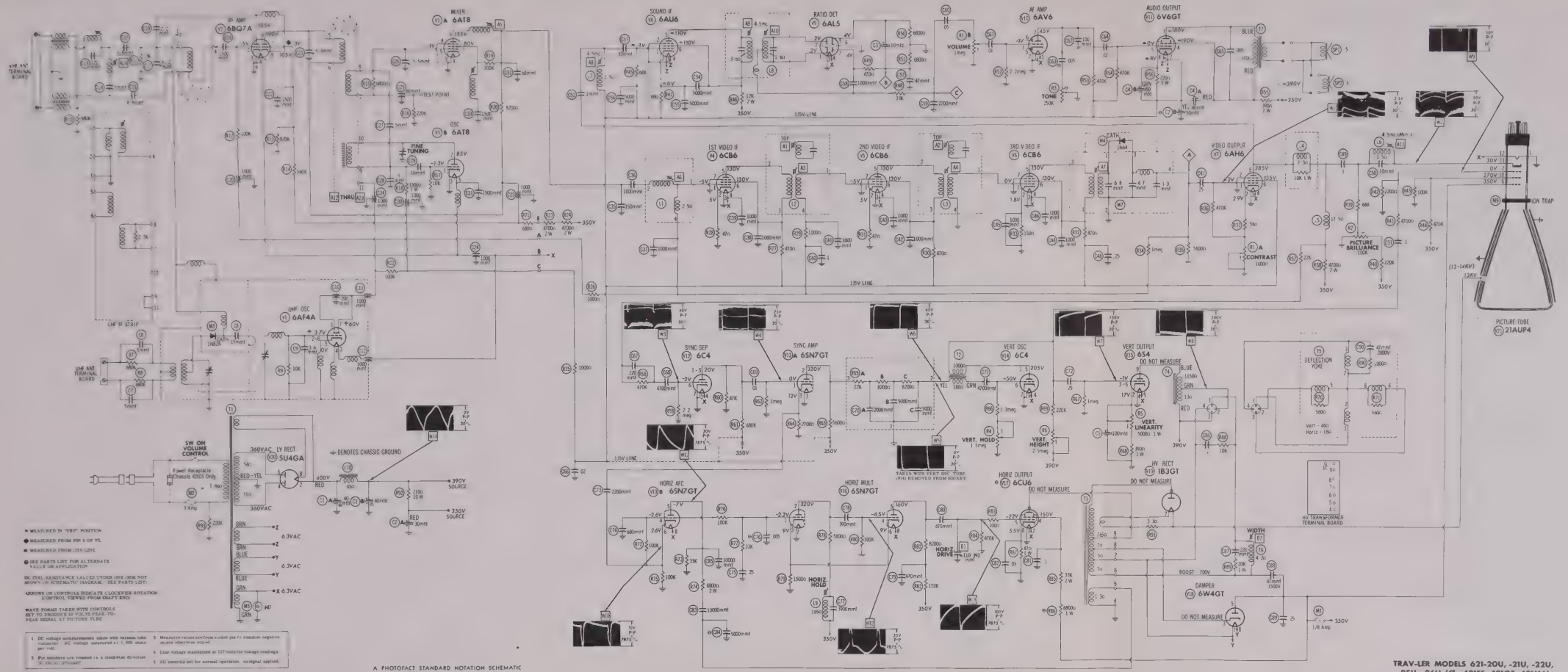
G581

DATE 9-56 SET 331 FOLDER 14


RF AMP V1 6BQ7A
MIXER V1A 6AT8
OSC V1B 6AT8
SOUND IF V8 6AU6
RATIO DET V9 6AL5
AF AMP V10 6AV6
AUDIO OUTPUT V11 6V6GT
1ST VIDEO IF V4 6CB6
2ND VIDEO IF V5 6CB6
3RD V DEO IF V6 6CB6
VIDEO OUTPUT V7 6AH6
UHF OSC V1 6AF4A
SYNC SEP V12 6C4
SYNC AMP V13A 6SN7GT
VERT OSC V14 6C4
VERT OUTPUT V15 6S4
HORIZ AFC V13B 6SN7GT
HORIZ MULT V16 6SN7GT
HORIZ OUTPUT V17 6CU6
HV RECT V19 1B3GT
DAMPER V18 6W4GT
SW ON VOLUME CONTROL
360VAC LV RECT V20 5U4GA
PICTURE TUBE V21 21AUP4
ION TRAP
DEFLECTION YOKE
HV TRANSFORMER TERMINAL BOARD
UHF IF STRIP
UHF ANT TERMINAL BOARD
VHF ANT TERMINAL BOARD
DENOTES CHASSIS GROUND
135V LINE
TRAV-LER MODELS 621-20U, -21U, -22U, -25U, -26U (Ch. 421E5, 421G5, 421M6)

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TRAV-LER MODELS 621-20U, -21U, -22U, -25U, -26U (Ch. 421E5, 421G5, 421M6)

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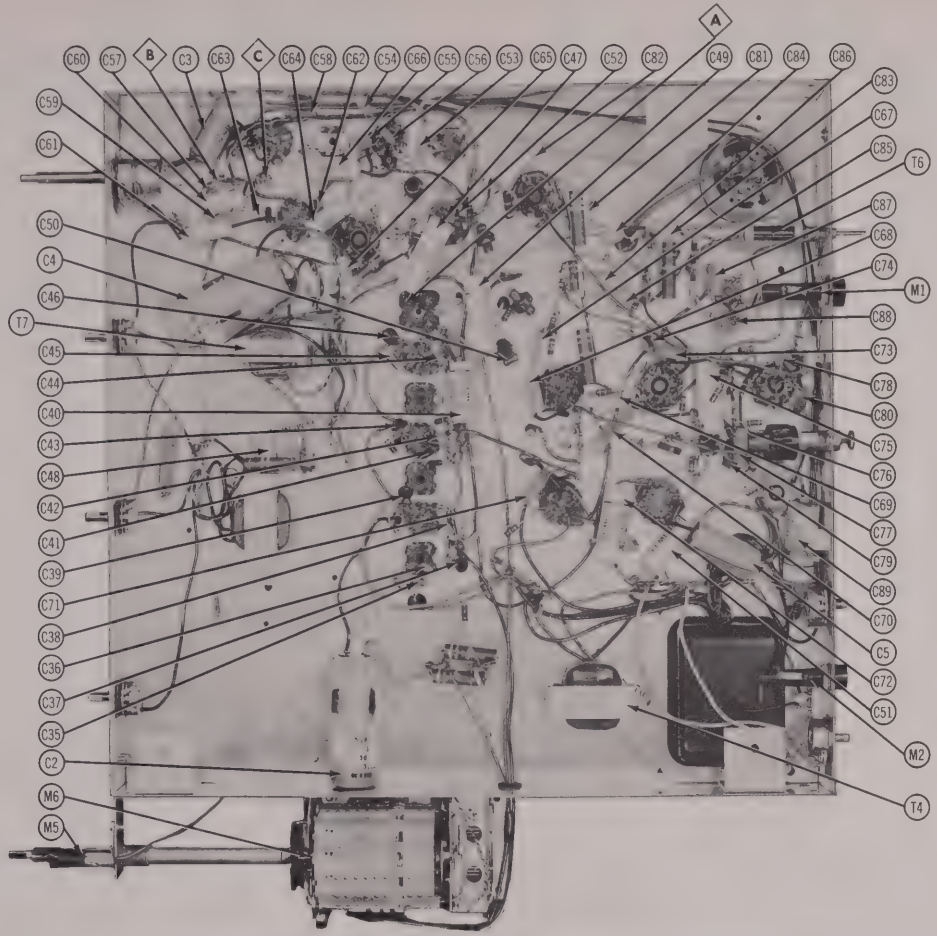
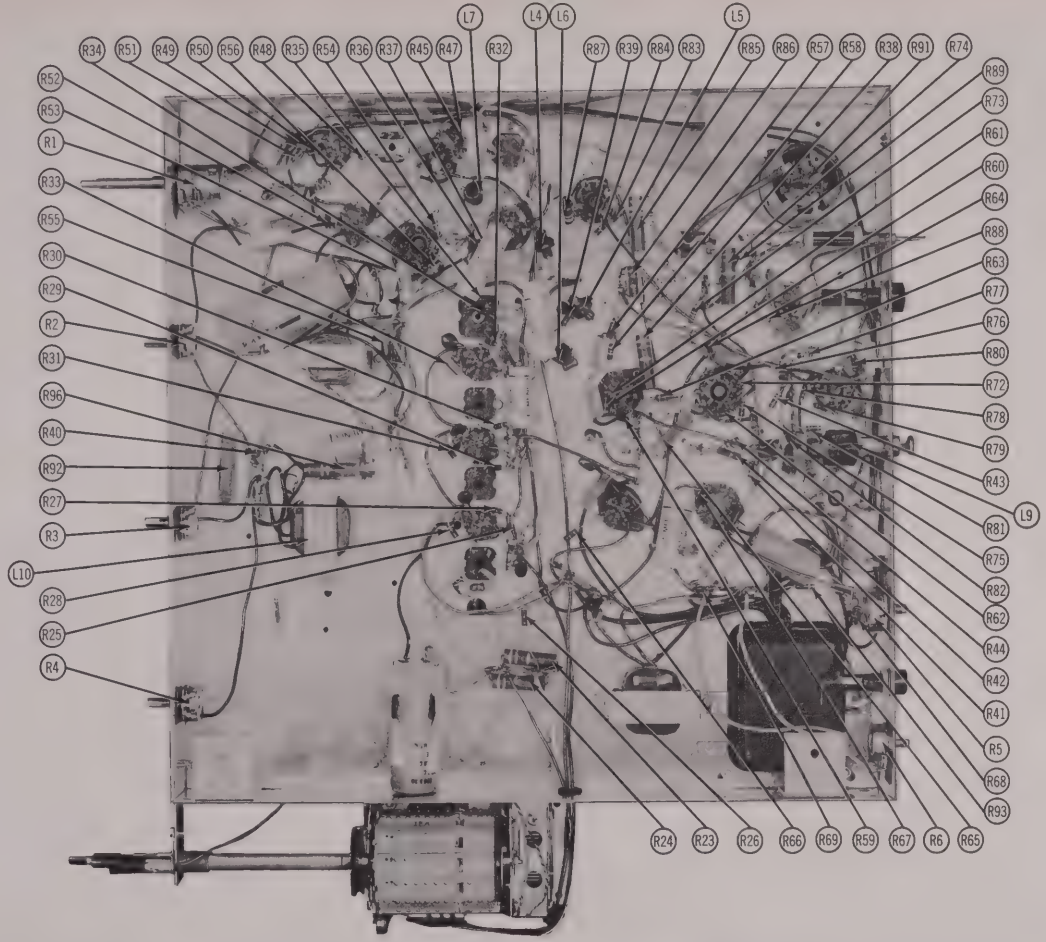
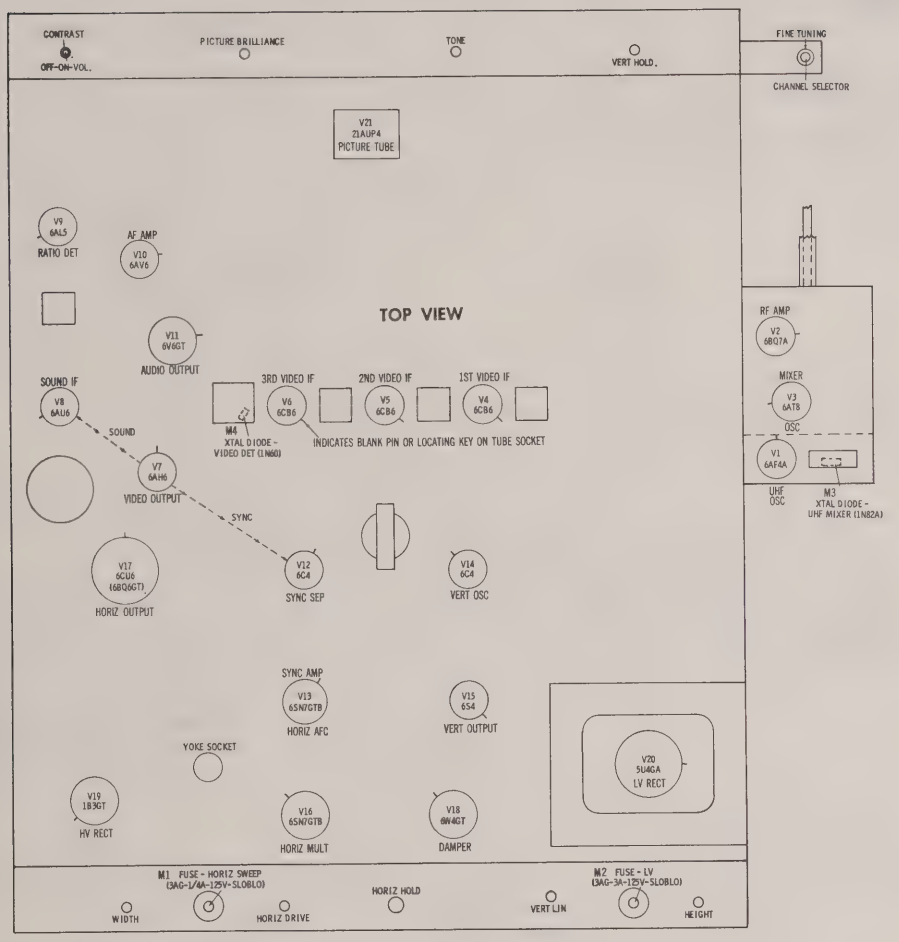


CHASSIS BOTTOM VIEW-CAPACITOR AND ALIGNMENT IDENTIFICATION



CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - V20, Fuse (M2)

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V3, V4, V5, V6, V7, V11 (V1 UHF only)
No pic, no sound, has snow - V2, V3, V4
No pic, has sound, has raster - V7, V21
Has pic, no sound - V8, V9, V10, V11

SYNC FAILURE
No vert. sync - V13, V14
No horiz. sync - V13, V16
No vert. or horiz. sync - V12, V13

SWEEP FAILURE
No raster, has sound - V16, V17, V18, V19, V21, Fuse (M1)
No vertical deflection - V14, V15
Poor vert. linearity or foldover - V14, V15
Poor horiz. linearity or foldover - V16, V17, V18
Narrow picture - V16, V17, V18, V19, V20
Vert. off freq. - V13, V14
Horiz. off freq. - V13, V16

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be securely taped and kept away from chassis. Do not remove the horizontal multivibrator tube (V16) to disable the high voltage.

VIDEO IF ALIGNMENT

Connect the negative lead of a 1.5 volt battery to the ungrounded side of C40. Connect the positive lead to chassis.
Set the channel selector between any two VHF channels. This will disable the local oscillator and reduce the possibility of erroneous indications.
Use only enough sweep and marker generator output for usable pattern on scope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over converter tube. Low side to chassis.	44MC (10MC Swp)	41.25MC 47.25MC	Set between any two channel	Vert. Amp. thru 10K to point (A). Low side to chassis.	A1, A2	Adjust A1 (41.25MC) and A2 (47.25MC) to place 41.25MC and 47.25MC markers in trap notch as in Fig. 1. Use high scope gain and increase sweep ganerator for output to observe trap notches.
2.	"	"	"	42.25MC 44.0MC 45.75MC	"	"	A3, A4, A5, A6, A7	Adjust A3 thru A7 for response curve similar to Fig. 1. A3 affects the low frequency side of response curve. A4 affects the high frequency side of response curve. A5 and A6 should be adjusted for proper symmetry, flatness and bandwidth. A7 affects tilt.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
3.	Direct	High side to point (A). Low side to chassis.	4.5MC (Unmod)	Any	DC probe to point (B). Common to chassis.	A8, A9	Adjust for maximum deflection.
4.	"	"	"	"	DC probe to point (C). Common to chassis.	A10	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60~ modulation and 450KC sweep. Use 120~ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
3.	Direct	High side to point (A). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. Amp. to point (B). Low side to chassis.	A8, A9	Disconnect stabilizing capacitor (C3). Adjust for curve of maximum amplitude and symmetry similar to Fig. 2.
4.	"	"	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A10	Reconnect C3. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 3. SLIGHTLY retouch A9 for maximum amplitude and straightness of crossover lines.

4.5MC TRAP ALIGNMENT

Set the contrast control (R1A) for maximum contrast.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
5.	Direct	High side to point (A). Low side to chassis.	4.5MC (Unmod)	Any	DC probe thru detector (Fig.4) to pin 11 (cathode) of picture tube. Common to chassis.	A11	Adjust for MINIMUM deflection.

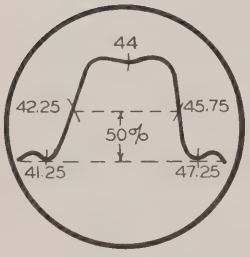


FIG. 1

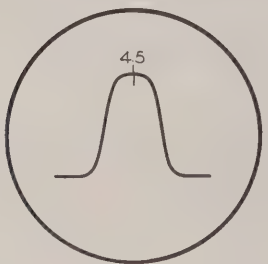


FIG. 2

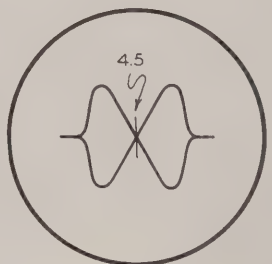


FIG. 3

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ALIGNMENT INSTRUCTIONS (cont)

VHF OSCILLATOR ALIGNMENT

Connect the negative lead of a 3 volt bias battery to the ungrounded side of C40. Connect the positive lead to chassis.
The channel oscillator adjustment screws are reached thru a hole just below and to the right of the channel switch shaft.
The correct adjustment screw is accessible thru this hole as the channel switch is turned to each channel.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6.	Two 120Ω Carbon Resistors	Across VHF antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 10KΩ to point (A). Low side to chassis.	A12	Adjust to place sound marker in trap notch as in Fig. 5. Video marker should be at 50%.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A13	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A14	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A15	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A16	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A17	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A18	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A19	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A20	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A21	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A22	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A23	

VHF RF AND MIXER ALIGNMENT

This portion of the VHF tuner has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.

IF WAVE TRAP ADJUSTMENT

The IF wave trap should be tuned to minimize interference cause by signals which fall within the video IF bandpass (40-48MC). Tune in a station on which the interference is noted and adjust A24 for MINIMUM interferance in the picture.

UHF TUNER ALIGNMENT

The UHF portion of this tuner has been properly aligned at the factory and is very stable. Alignment of this portion is not recommended in the field.

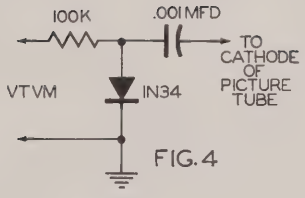


FIG. 4

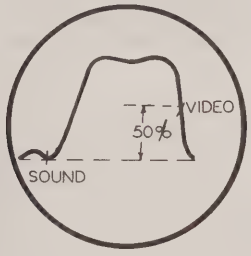
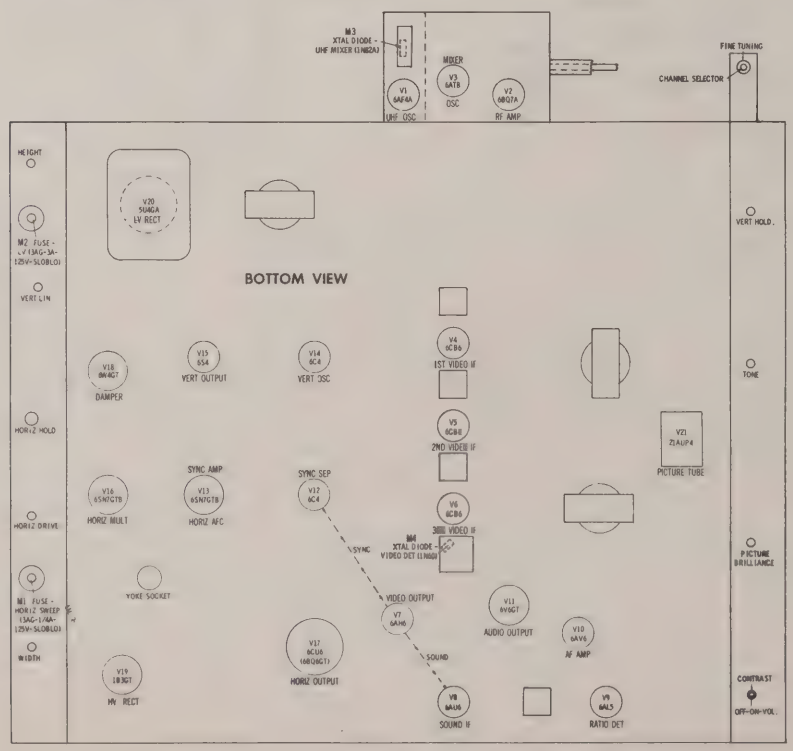


FIG. 5

RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6AF4A	• ■4300Ω	10K	.1Ω	0Ω	0Ω	10K	• ■ 4300Ω		
V2	6BQ7A	INF	1Meg	0Ω	0Ω	.1Ω	†10K	350K	INF	0Ω
V3	6AT8	10K	■ 4300Ω	0Ω	0Ω	.1Ω	†18K	†120K	0Ω	220K
V4	6CB6	1Meg	47Ω	0Ω	.1Ω	■ 470Ω	■470Ω	0Ω		
V5	6CB6	1Meg	47Ω	0Ω	.1Ω	■470Ω	■ 470Ω	0Ω		
V6	6CB6	0Ω	150Ω	0Ω	.1Ω	■ 470Ω	■470Ω	0Ω		
V7	6AH6	470K	0Ω	0Ω	.1Ω	†4700Ω	150KΩ	● 180Ω		
V8	6AU6	220K	150K	150K	150K	†12K	†12K	■ 68Ω		
V9	6AL5	INF	INF	0Ω	.1Ω	6800Ω	0Ω	7300Ω		
V10	6AV6	2.2Meg	0Ω	.1Ω	0Ω	NC	NC	■ 470K		
V11	6V6GT	NC	150K	†1000Ω	†600Ω	600K	TP	150K	150K	
V12	6C4	†150K	TP	0Ω	.1Ω	†150K	2.2Meg	0Ω		
V13	6SN7GT	1Meg	†6000Ω	2700Ω	200K	33K	100K	0Ω	.1Ω	
V14	6C4	†● 650K	NC	0Ω	.1Ω	†● 650K	● 1.5Meg	0Ω		
V15	6S4	NC	● 1000Ω	1Meg	0Ω	.1Ω	1Meg	NC	NC	†1200Ω
V16	6SN7GT	300K	†5800Ω	1500Ω	100K	†160K	1500Ω	0Ω	.1Ω	
V17	6CU6	NC	.1Ω	NC	†40K	470K	TP	0Ω	47Ω	TOP CAP ▲ 7Ω
V18	6W4GT	NC	NC	INF	NC	†275Ω	NC	INF	INF	
V19	1B3GT	PINS 1-8 HAVE INF RESISTANCE								TOP CAP ▲270Ω
V20	5U4GA	INF	70K	INF	51Ω	INF	54Ω	INF	70K	
V21	21AUP4A	0Ω	2200Ω	PIN 6 †275Ω	PIN 10 †80K	PIN 11 †200K	PIN 12 .1Ω			

• MEASURED IN "UHF" POSITION
■ MEASURED FROM 135V LINE
† MEASURED FROM PIN 2 OF V20.
▲ MEASURED FROM PIN 3 OF V18.
● THIS READING WILL VARY. CONTROL SET FOR NORMAL OPERATIONS.
TP TIE POINT
NC NO CONNECTION



TUBE PLACEMENT CHART

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TRAV-LER MODELS 621-20U, -21U, -22U, -25U, -26U (Ch. 421E5, 421G5, 421M6)

CHASSIS TOP VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	UHF Oscillator	6AF4A	
V2	RF Amplifier	6BQ7A	
V3	Mixer-Oscillator	6AJ8	
V4	1st Video IF Amplifier	6CB6	
V5	2nd Video IF Amplifier	6CB6	
V6	3rd Video IF Amplifier	6CB6	
V7	Video Output	6AH6	
V8	Sound IF Amplifier	6AU6	
V9	Ratio Detector	6AL5	
V10	AF Amplifier	6AV6	
V11	Audio Output	6V6GT	
V12	Sync Separator	6C4	
V13	Sync Amp.- Horiz.AFC	6BN7GT	
V14	Vert Osc	6C4	
V15	Vert Output	6S4	
V16	Horiz Shut.	6BN7GT	
V17	Horiz. Output	6CU5	Note 1
V18	Damper	6W4GT	
V19	HV Rectifier	1B3GT	
V20	LV Rectifier	5U4GA	

Note 1. 6BQ6GT may be used in some models.

PICTURE TUBE

ITEM No.	REPLACEMENT DATA			NOTES
	TRAV-LER PART No.	J.B.S PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	
V21	21AUP4A ①	21AUP4A ①	21AUP4A ①	21AUP4A B ①	① Aluminized ② Silver screen "BS"
		21AUP4	21AUP4 ②		

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA							
	CAP	VOLT	TRAV-LER PART No.	AEROVOX PART No.	CORNELL DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.	
C1A	40	450	TY-EC-16	AFH2-57	B045	FP338	TMD54	D-235	TVL-3784	
B	40	450								
C2A	30	450	TY-EC-25	PBR450V303Q	BR3043		TC77	D-415	RS548 *	
B	30	300	(Note 1)		BR3026		TC59			
C3	30	50	TY-EC-30	PBR50V10	BR105	TC33	TD-10-50	FM-0510	TVA-1304	
C4A	40	450	TY-EC-17	PBR450V404Q	BR4045	TCD3197	TD-40-450	FM-4540	RU353 *	
B	50				BR505		TD-50-50	FM-0550		
C5	25	25	TY-EC-27	PBR25V100	BR1251	TC350	TD-100-25	MTH-3510	TVA-1307	

Note 1. In some versions, C2B may be 60MFD @ 300 volts in this application.
* Non-cabling item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA								NOTES
	CAP	VOLT	TRAV-LER PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.		
C4	5										
C5	5										
C6	15										
C7	5.6										
C8	300										
C11	1000										
C12	1000										
C13	120			DH-00013	DD-121	G044	811-121	UC-5213	5GA-T12		
C14	5										
C15	6.8			NPO-681.0	TCZ-6R8	Z013	NPOA-6R8	Z7-5568	5TCCB-V68		
C16	6.8			NPO-681.0	TCZ-6R8	Z013	NPOA-6R8	Z7-5568	5TCCB-V68		
C17	3-12										
C18	300			BPD-0015	DD-152	E071	801-0015	DC5213	5HK-D15		
C19	3.3			NPO-3R3.0	TCZ-3R3	Z006	NPOA-3R3		5TCCB-V33		
C20	300										
C21	3-3				E39-3		312S-01-0R5	C7565A			
C22	1500			BPD-0015	DD-152	K071	801-0015	DC-5215	5HK-D15		
C23	1000										
C24	1000										
C25	60										
C26	3-8										
C27	5			NPO-D15	TCZ-4R7	S011	NPOA-060	ET-556	5TCCB-V47		
C28	5			NPO-D15	TCZ-4R7	S011	NPOA-060	ET-556	5TCCB-V47		
C29	10										
C30	1000										
C31	1500			BPD-0015	DD-152	E071	801-0015	DC-5215	5HK-D15		
C32	68			NTD-D68	TCN-68	N088	NT601-680		5TCU-Q68		
C33	1500			BPD-0015	DD-152	E071	801-0015	DC-5215	5HK-D15		
C34	1000										
C35	150			S156	D6-151	T090	GPSK-151	UC-5215	5GA-T15		
C36	1000		TY-CC-2	BPD-001	DD-102	K069	801-001	DC-531	5HK-D1		
C37	1000		TY-CC-2	BPD-001	DD-102	K069	801-001	DC-531	5HK-D1		
C38	1000		TY-CC-2	BPD-001	DD-102	K069	801-001	DC-531	5HK-D1		
C39	1000		TY-CC-2	BPD-001	DD-102	K069	801-001	DC-531	5HK-D1		
C40	1	300	TY-CC-3	P388N-1	DF-104	CUSBP1		P7401	5TM-P1		
C41	1000		TY-CC-2	BPD-001	DD-103	K069	801-001	DC-531	5HK-D1		
C42	1000		TY-CC-2	BPD-001	DD-103	K069	801-001	DC-531	5HK-D1		
C43	1000		TY-CC-2	BPD-001	DD-103	K069	801-001	DC-531	5HK-D1		
C44	1000		TY-CC-2	BPD-001	DD-103	K069	801-001	DC-531	5HK-D1		
C45	1000		TY-CC-2	BPD-001	DD-102	K069	801-001	DC-531	5HK-D1		
C46	1000		TY-CC-2	BPD-001	DD-102	K069	801-001	DC-531	5HK-D1		
C47	1000		TY-CC-2	BPD-001	DD-102	K069	801-001	DC-531	5HK-D1		
C48	25	300	TY-PC-4	P385N-25		CUSBP2R		P7402	5TM-P25		
C49	.1	600		P668N-1		CUSBP1		P7901	5TM-P1		
C50	.1	600	TY-PC-16	P668N-1		CUSBP1		P7901	5TM-P1		
C51	500		TY-CC-1	S500	TCZ-0	T070	NPOA-100	ET-541	5TCC-Q1		
C51	.1	600	TY-PC-16	P668N-1	DF-104	CUSBP1		P7901	5TM-P1		
C52				NPO-S01	TCZ-1		NPOA-100		5TCCB-V1		
C53	13			S133	D6-130	TP37	GPSK-330	UC-5433	5GA-Q33		
C54	5000		TY-CC-3	BPD-005	DD-502	K060	811-005	DC-535	5HK-D5		
C55	5000		TY-CC-3	BPD-005	DD-502	K060	811-005	DC-535	5HK-D5		
C56	5000		TY-CC-3	BPD-005	DD-502	K060	811-005	DC-535	5HK-D5		
C57	47		TY-CC-13	S470	D6-470	T080	GPSK-470	UC-5247	5GA-T47		
C58	1000		TY-CC-7	S1000	D6-102	TP53	GPSL-105	UC-531	5GA-D1		
C59	2300	500	TY-MC-11	1464-0023		DRD3E3			1FM-347		
C60	.05	600		BPD-05	DF-503	CUSB65		P7415	5TM-P5		
C61	.01	600	TY-PC-15	BPD-01	DE-103	CUSB51	GPS-233-103	P7511	5TM-S1		
C62	100	500	TY-PC-10	S100	D6-101	TWF71	GPSE-101	UC-531	5GA-T1		
C63	.005	600	TY-PC-10	BPD-005	DE-502	CUSB26	GPS-233-502	P7535	5TM-D5		Note 4
C64	.005	600	TY-PC-14	BPD-005	DF-203	CUSB28	ET-42	P7513	5TM-S5		
C65	.005	600	TY-PC-10	BPD-005	DE-502	CUSB26	GPS-233-502	P7535	5TM-D5		
C66	.02	500	TY-PC-14	BPD-02	DF-203	CUSB22	ET-42	P7513	5TM-S2		
C67	2200	500	TY-MC-13	1X330		TWS723	GPSK-331	UC-5323	1FM-323		
C68	4700	500		BPD-0047	D6-472	TWRD47	GPS-333-473	UC-5347	1FM-347		
C69	.01	600	TY-PC-15								
C70A	2000							DC-522			
B	5000		TY-CC-36	†PA-110	†PC-100	†115TMI	†1408-01	DC-5235	†Y-1		
C	5000							DC-525			
C71	4700	500		BPD-0047	D6-472	TWRD47	GPS-333-473	UC-5347.	1FM-347		
C72	.25	600		P683N-25		CUSBP25		P7903S	5TM-P25		
C73	2300	500	TY-MC-11	1464-0023		IR5022			MH-323		
C74	680		TY-MC-15	1464-0006S	D6-681	TWRD68	811-681		MH-368		

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	TRAV-LER PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C75	.25	300	TV-PC-4	P388N-25		CUB22P2		PT4025	3TM-P25	
C76	.005	600	TV-PC-10	BPD-005	D6-502	CUBMD5	GPS-333-502	PT525	5TM-D5	Note 2
C77	1900	500	TV-MC-12	1464-0028		DRD3P3		MCD483	MH-319	
C78	390	500			D6-391	5R5T39	811-391		MH-339	
C79	470	500		1464-00047	D6-471	5R5T47	811-471	MCE345	MH-347	
C80	470	500		1464-00047	D6-471	5R5T47	811-471	MCE345	MH-347	
C81	.1	600	TV-PC-16	P668N-1	DF-104	CUB6P1		PT601	5TM-P1	
C82	.05	600		BPD-05	DF-503	CUBM5		PT405	5TM-S5	
C83	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C84	5000		TV-CC-3	BPD-005	DD-502	K060	811-005	DC-535	5HK-D5	Note 3
C85	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C86	.1	600	TV-PC-16	P668N-1	DF-104	CUB6P1		PT601	5TM-P1	
C87	120	300	TV-MC-3	S120	D6-121	5W5T12	GPSK-121	UC-5322	1FM-322	
C88	47	1500		HVD-15-47	DD30-470	V2Q47	5KV-470	DC30447	30GA-Q47	
C89	.25	600		P688N-25		CUB6P25		PT6025	5TM-P25	
C90	47	2000		HVD-20-47	DD30-470	V2Q47	5KV-470	DC30447	20GA-Q47	

† Items C70A, C70B, C70C, R65A, R65B and R65C are combined in one unit.
Note 2. Some versions may use .05MFD unit (part #TV-PC-14) in this application.
Note 3. Chassis 421E5 and 421G5 use a 10000MMF unit (part #TV-CC-5) in this application.
Note 4. Used only with chassis 421M5.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA						INSTALLATION NOTES
	RESIST ANCE	WATTS	TRAV-LER PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.		
R1A	1000Ω	1	VC-80	F1-4		*Q2-256	UF31L	Contrast (Panel)	
B	1Meg			R2-52			UR16A	Volume (Panel)	
C	Switch			KB-1			US-36	Attach to R1B	
R2A	100Ω	1	VC-42	AB-40	A47-100K-S	QU1-128	TA15L	Picture Brilliance	
B	Shaft		Not Req.	AK-4		Not Req.	Not Req.	Attach to R2A	
R3A	250K	1	VC-79	AB-51			U45	Tone - Note 1	
B	Shaft		Not Req.	AK-4		Not Req.	Not Req.	Attach to R3A	
R4A	1.5Meg	1	TV-VC-83	AB-743	A47-1.5Meg-S	QU1-138	TA15SL	Vert. Hold	
B	Shaft		Not Req.	AK-4	KS8-3	Not Req.	Not Req.	Attach to R4A	
R5A	5000Ω	1	TV-VC-39	VK-135	A43-5000	WP65000	H5000L	Vert. Linearity	
B	Shaft		Not Req.	Not Req.	FK8-1/4	Not Req.	Not Req.	Attach to R5A	
R6A	2.5Meg	1	TV-VC-59	HX-83	A47-2.5Meg-S	QU1-239	TA255L	Vert. Height	
B	Shaft		Not Req.	Not Req.	FK8-1/4	Not Req.	Not Req.	Attach to R6A	

* Concentricit Equivalent: K-3 K11, Base Elements & Shafts: BU-198 & PI-204 (Pane).
BU-197 & R3-215 (Rear)
76-1 Switch

Note 1. Used in chassis 421M5 only.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	TRAV-LER PART No.	IRC PART No.	
R7	680K			BTS-680K	
R8	680K			BTS-680K	
R9	68K			BTS-68K	
R10	680K			BTS-680K	
R11	68K			BTS-68K	
R12	100K			BTS-100K	
R13	820K			BTS-820K	
R14	560K			BTS-560K	
R15	2500Ω			BTS-2500	
R16	330K			BTS-330K	
R17	68K			BTS-68K	
R18	3300Ω	1		BTA-3300	
R19	100K			BTS-100K	
R20	8200Ω			BTS-8200	
R21	680Ω			BTS-680	
R22	100K			BTS-100K	
R23	47000Ω	2		BTB-47000	
R24	4700Ω	2		BTB-4700	
R25	1000Ω		TV-IR-6	BTS-1000	
R26	1000Ω		TV-IR-97		
R27	470Ω			BTB-1000	
R28	47Ω		TV-IR-7	BTB-470	
R29	1000Ω		TV-IR-97	BTB-47	
R30	470Ω			BTB-1000	
R31	47Ω		TV-IR-8	BTB-470	
R32	470Ω		TV-IR-97	BTB-47	
R33	150Ω		TV-IR-8	BTB-470	
R34	1Meg		TV-IR-150	BTB-150	
R35	5600Ω		TV-IR-52	BTB-1Meg	
R36	470K		TV-IR-51	BTB-5600	
R37	56Ω		TV-IR-113	BTB-470K	
R38	4700Ω	2		BTB-56	
R39	68K		TV-IR-67	BTB-4700	
R40	220K		TV-IR-61	BTB-68K	
R41	470Ω		TV-IR-43	BTB-220K	
R42	3200Ω		TV-IR-67	BTB-470	
R43	100K		TV-IR-43	BTB-3200	
R44	470K		TV-IR-61	BTB-100K	
R45	68K		TV-IR-61	BTB-470K	
R46	33K	2		BTB-68K	
R47	68Ω			BTB-33K	
R48	33K		TV-IR-58	BTB-68	
R49	470Ω		TV-IR-7	BTB-33K	
R50	680Ω		TV-IR-78	BTB-470	
R51	680Ω			BTB-680	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	TRAV-LER PART No.	IRC PART No.	
R52	2.2Meg		TV-IR-13	BTB-2.2Meg	
R53	470K		TV-IR-11	BTB-470K	
R54	470K		TV-IR-11	BTB-470K	
R55	330Ω	1		BTA-390	
R56	220Ω			BTA-220	
R57	22K		TV-IR-65	BTB-22K	
R58	470K		TV-IR-11	BTB-470K	
R59	2.2Meg		TV-IR-13	BTB-2.2Meg	
R60	47K		TV-IR-66	BTB-47K	
R61	680K			BTB-680K	
R62	1Meg		TV-IR-105	BTB-1Meg	
R63	5600Ω		TV-IR-52	BTB-5600	
R64	3700Ω			BTB-3700	
R65A	22K			(5TB-22K	
B	62000		†TV-CC-26	†5TB-6200	
C	8200Ω			5TB-8200	
R66	1.5Meg			BTP-1.5Meg	
				5%	
R67	1Meg		TV-IR-105	BTB-1Meg	
R68	220Ω	1		BTA-220	
R69	22K		TV-IR-61	BTB-220K	
R70	560Ω				
R71	560Ω				
R72	100K		TV-IR-43		
R73	33K		TV-IR-58		
R74	5600Ω	2			
R75	100K		TV-IR-43		
R76	100K		TV-IR-43		
R77	33K		TV-IR-58		
R78	5600Ω 5%		TV-IR-52		
R79	1500Ω		TV-IR-39		
R80	100K		TV-IR-43		
R81	8200Ω		TV-IR-60		
R82	150K				
R83	100Ω		TV-IR-104		
R84	470K		TV-IR-11		
R85	33K	2			
R86	5600Ω	1			Note 1
R87	470	1			
R88	10K	1	TV-IR-64		
R89	10K	1			
R90	1000Ω				
R91	3.3Ω			5W-3.3	
R92	220Ω	10		1.5/4.-200	
R93	220K 5%		TV-IR-91	BTB-220K	

Note 1. In chassis 421E5, 421G5, an 18K, 1W resistor is used in this application.
† Items R65A, R65B, R65C, C70A, C70B, C70C are combined in one unit.

TRANSFORMER (POWER)

ITEM No.	RATING					REPLACEMENT DATA				
	PRI	SEC 1	SEC 2	SEC 3	TRAV-LER PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	LITVAC ① 1.8A	760VCT ② .300A	5VAC ③ 2A 6.3VAC ④ 7A SEC 1 & SEC 2 6.3VAC ⑤ 1.2A	6.3VAC ④ 7A SEC 1 & SEC 2 6.3VAC ⑥ 6.7A	TV-TR-13					

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA						
		TRAV-LER PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T3	Vert. Osc. Trans.	TV-TR-10	B6702	A-3003	207T5 ①	V405	A-8125	25A03	A-97X
T3	Horiz. Output Trans.	TV-TR-15		HVO-5744		X130* ②	A-8272* ③	FLY-5491	
				④			④	④	
T4	Vert. Output Trans.	TV-TR-9	Z1804	A-3037	223T1	V313	A-8125	26S83	A-103X
T5A	Yoke-Horiz.(50MH)	TV-L-53	DF601 ⑤	MDF-76 ⑤	306U1 ⑤	T70FB/43 ⑤	D7-5A ⑤	Y-6 ⑤	T-31-10 ⑤
B	Vert. (25MH)					45 ⑤			
T6	Width Coil		RF804	MWC-3	306R1	30UR15A	WC-1	WC-16 ⑦	WC-13 ⑦
				(.45-4.4MH)					

① Drill new mounting hole(s).
② Use original mounting bracket.
③ Use original terminal board.
④ Requires new centering device.
⑤ Connect horizontal damping network across terminals 6S and 6T. Use original if necessary.
⑥ Use original yoke damping network.
⑦ Do not use tap.
* This part may be superceded by Parts Manufacturer's introduction of special unit for this application.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
9				9	2	Red	
				Jumper		Jumper	
8				8 & 7	7	Blue & white	
7				6	5	Brown	
6				5	3	Green	
5				4	4	Black	
4				3	5	Yellow	

TRANSFORMER (AUDIO OUTPUT)

ITEM No	IMPEDANCE		REPLACEMENT DATA					NOTES
	PRI.	SEC.	TRAV-LER PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T7	5.7KΩ	3-4Ω	TV-AT-17		Z1907	A-3819	A-3849	26849	S-52	

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	TRAV-LER PART No.	QUAM PART No.	RCA TYPE No	
SP1	8"	PM	3-4Ω	SPK-36A	5A1	20S83	
SP2	5"	PM	3-4Ω	SPK-36A	5A1	20S83	

COILS (RF-IF)

ITEM No.	USE	DC RES		REPLACEMENT DATA				NOTES
		PRI.	SEC.	TRAV-LER PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	1st. Video IF	0Ω	0Ω	TV-L-47		TV-1327 *	6232*	Includes RF choke-3.5Ω
L2	2nd. Video IF	0Ω	0Ω	TV-L-49	17-5002 *	TV-137 *	6233*	Includes 41.25MC trap
L3	3rd. Video IF	0Ω	0Ω	TV-L-48	17-5003 *	TV-139 *	6233*	Includes 47.25MC trap
L4	Series Peaking Coil	7.3Ω		TV-L-31	19-6300	TV-134 *	6364	1PF Microhenries, wound on 10K, 1W resistor
L5	Shunt Peaking Coil	17.5Ω		TV-L-33Ω			6366	764 Microhenries
L6	4.5MC Trap	1.5Ω		TV-L-35A	20-1006	TV-181	1668	
L7	Sound IF	1.5Ω		TV-L-35B				
L8	Ratio Det.	2.5Ω	1.8OCT	TV-L-37	17-3497	TV-118	6308	Tertiary winding-1Ω

* Use adaptor plate.
* Parallel with 10K, 1 W resistor.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES.		REPLACEMENT DATA						NOTES
	PRI.	SEC.	TRAV-LER PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	RCA TYPE No	Ram PART No	Thordarson PART No	
L9	185Ω		TV-L-16	19-1570 *	TV-163 *	6310 *			25S20 *	

* Drill new mounting hole.

FILTER CHOKE

ITEM No.	RATINGS		REPLACEMENT DATA					
	TOTAL DIRECT CURRENT	D.C. RESISTANCE	INDUCTANCE @ CURRENT 1000 ~/~	TRAV-LER PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L10	.200ADC	65Ω	2.5 Hy.		C-3030 ①	C-3901 ①	C-2325 ①	28C43	C-17X ①

① Drill one new mounting hole.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA				
			TRAV-LER PART No.		LITTELFUSE PART No.		BUSS PART No.
			FUSE	HOLDER	FUSE	HOLDER	FUSE HOLDER
M1	3AG 8/B	1/4A 125V			312.250 (3AG 8/B 1/4A)	341001	MDL 1/4 HKP
M2	3AG 8/B	3A 125V			312003. (3AG 8/B 3A)	357001	MDX3 HKP

TRAV-LER MODELS 621-20U, -21U, -22U, -25U, -26U (Ch. 421E5, 421G5, 421M6)

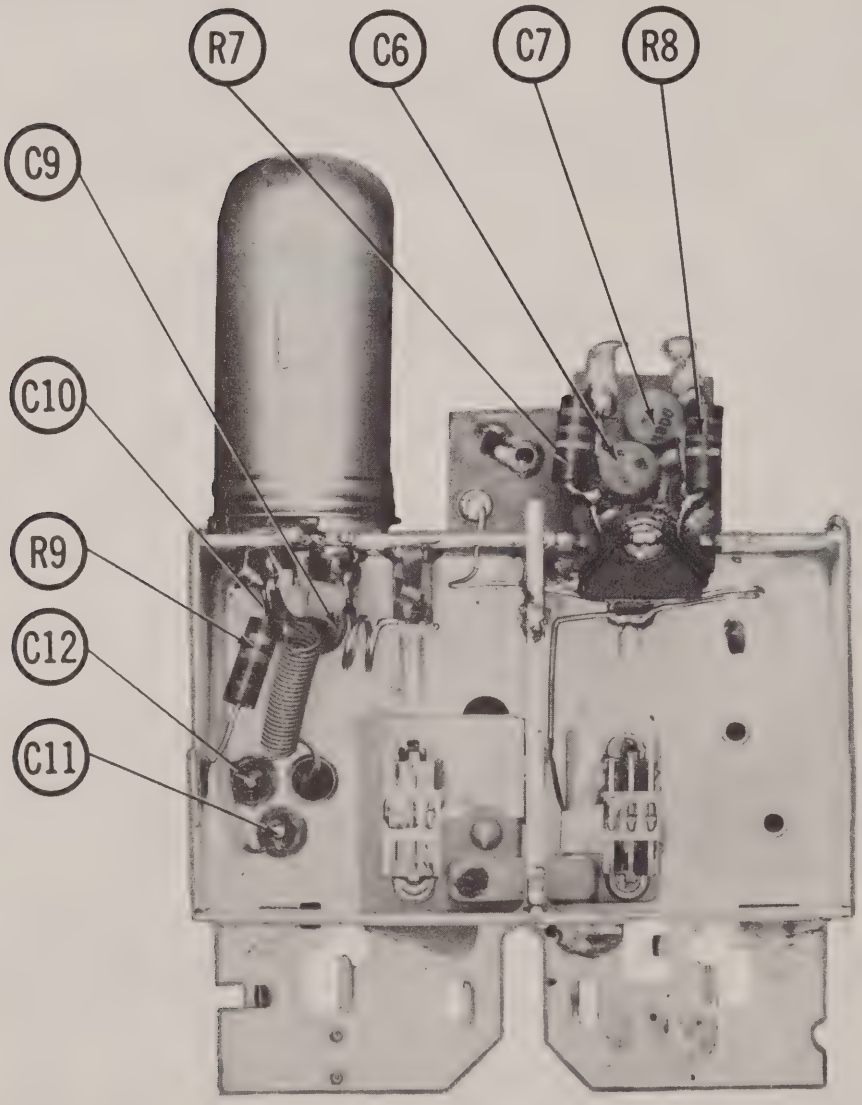
PARTS LIST AND DESCRIPTIONS (Continued)

CRYSTAL DIODES

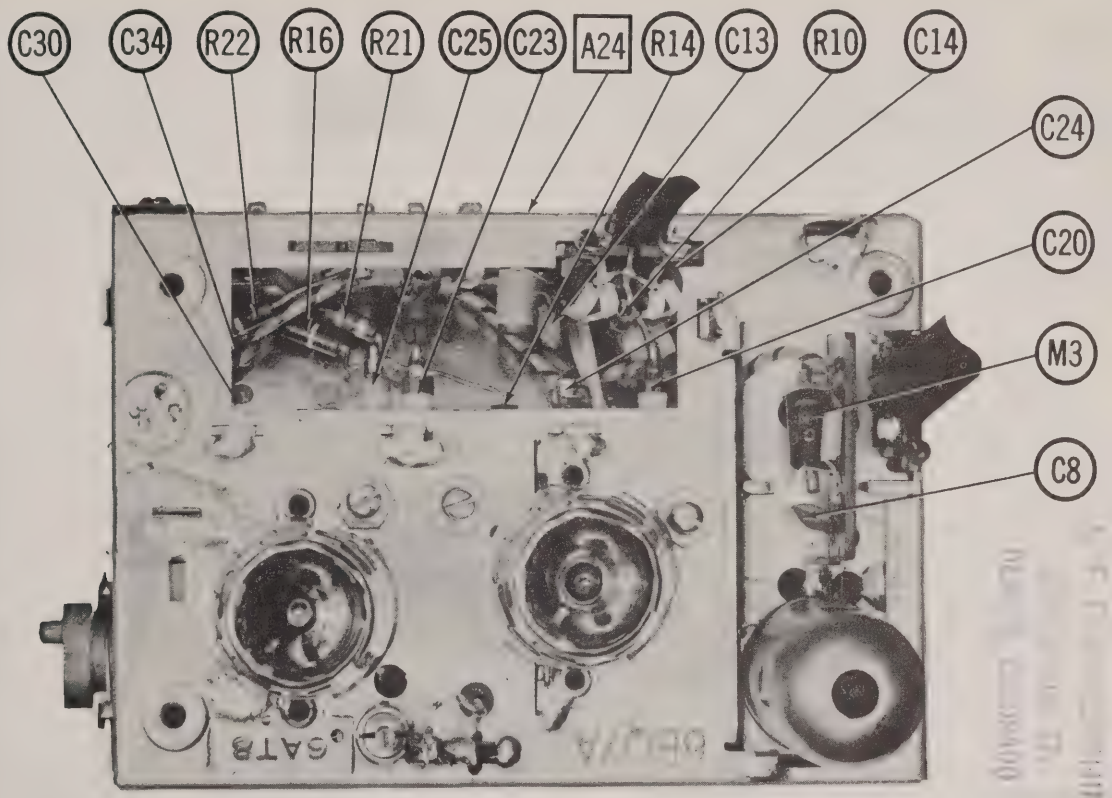
ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		TRAV-LER PART No.	SYLVANIA PART No.	
M3	1N82A		1N82A	UHF Mixer (Clip in)
M4	1N64		1N60	Video Detector (Pigtail)

MISCELLANEOUS

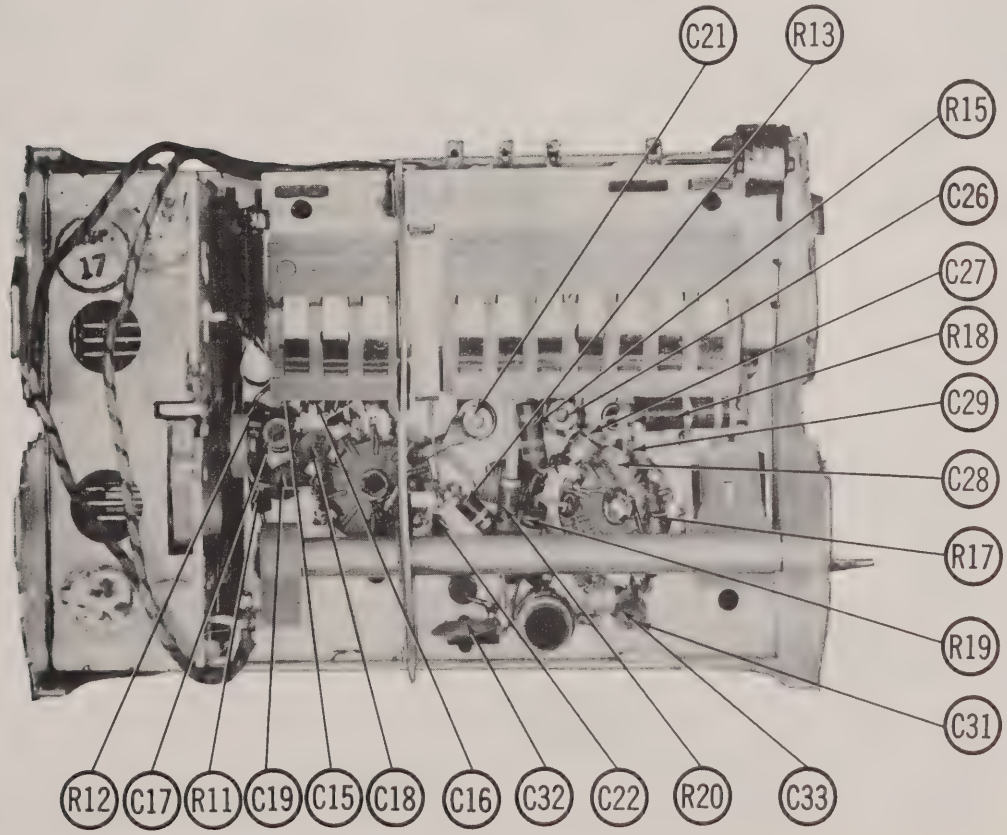
ITEM No.	PART NAME	TRAV-LER PART No.	NOTES
M5	Dial Light		#47
M6	Tuner	TA-26	VHF-UHF combination
M7	Video Detector Assy.	TVL-50	Includes M3, coils and capacitors
M8	Centering Device		Part of deflection yoke (T5) rear cover
M9	Ion Trap		
B1	Trimmer Cap.	TV-TC-11	Horiz. Drive (110-390MMF)



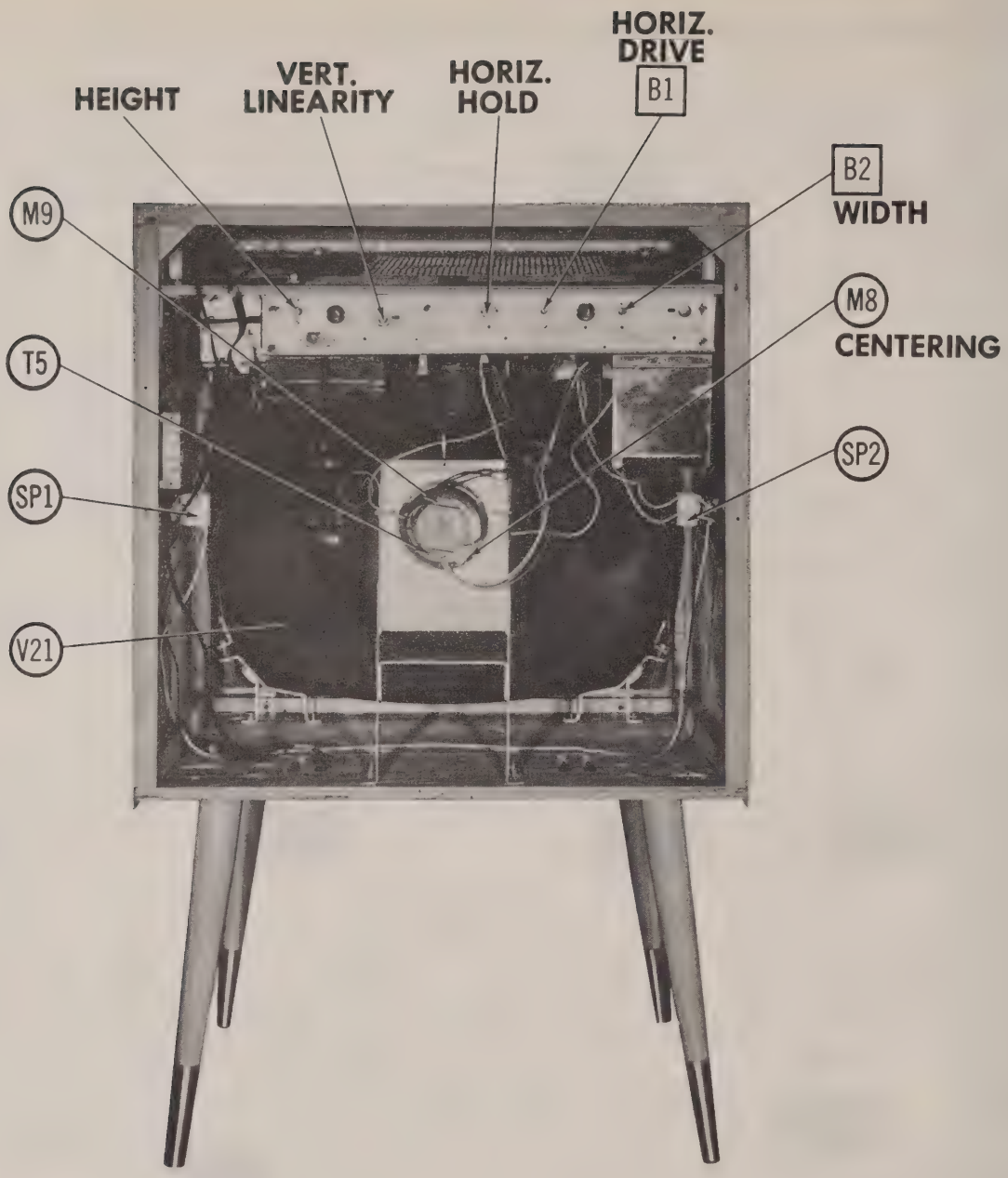
UHF TUNER FRONT VIEW



RF TUNER-TOP VIEW



RF TUNER-BOTTOM VIEW



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern. Adjust the horizonal hold (L9) until the picture synchronizes horizontally. Switch off channel and back again. Picture should now be locked in sync. If not, slightly readjust L9.

Turn contrast control (R1A) maximum counter clockwise and brightness control for maximum brightness. Turn the horizontal drive trimmer (B1) clockwise until white bars or compression near center of the raster appears.

Then turn B1 counter clockwise until the white bars or compression disappear. Adjust the horizontal width slug (B2) for a picture slightly wider than necessary to fill the picture mask horizontally.

WEBCOR MODELS
1655, 1656, 1659, 1660, 1662

WEBCOR MODELS
1655, 1656, 1659, 1660, 1662

TRADE NAME	Webcor Models 1655, 1656, 1659, 1660, 1662
MANUFACTURER	Webster-Chicago, 5610 Bloomingdale Ave., Chicago 39, Ill.
TYPE SET	AC Operated Phono Amplifier with 3 Speed Automatic Record Changer
TUBES (FIVE)	Types 12AX7 Preamplifier, 12AX7 AF Amp. -Phase Inv., (2) 6V6GT Output, 6X5GT Rectifier
POWER SUPPLY	110-120 Volts AC - 60 Cycles RATING .27 Amp. @ 117 Volts AC

RECORD CHANGER UNIT - WEBCOR MODEL 141

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

WEBCOR MODEL 1655

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Preamplifier	12AX7	
V2	AF Amp. -Phase Inv.	12AX7	
V3	Output	6V6GT	
V4	Output	6V6GT	
V5	Rectifier	6X5GT	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	WEBCOR PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	35	300	30P213	AFH3-43-50	C155	FP376. 9	TMT-39	T-160	TVL-3786
B	35	300							
C	15	250							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	WEBCOR PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	20000		30P246	BPD-02	DD-203	K085	817-02	PT412	5HK-S2	
C3	1500		30P252	BPD-0015	DD-152	K071	801-0015	DC5215	5HK-D15	
C4	10000		30P209	BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C5	2000		30P251	BPD-002	DD-203	K072	801-002	DC522	5HK-D2	
C6	. 05	400	30P042	BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C7	47		30P248	NP0-S147	D6-470	Z033	831-470	ZT-5447	MS-447	
C8	100		30P149	S1100	D6-101	TP34	801-101	UC-531	5GA-T1	
C9	1000		30P240	BPD-001	DD-102	K069	801-001	DC521	5HK-D1	
C10	2200		30P137	BPD-0022	D6-222	K073	811-0022	UC-5222	5GA-D22	
C11	. 05	400	30P042	BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C12	1500		30P098	BPD-0015	DD-152	K071	801-0015	DC5215	5HK-D15	
C13	. 05	400	30P042	BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C14	2200		30P137	BPD-0022	D6-222	K073	811-0022	UC-5222	5GA-D22	
C15	10000	1000	30P220	P1088N-01	DD-102	K082	811-01	DC511	5HK-S1	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	WEBCOR PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	1Meg	½	31P104					Audio Level, Tapped at 150K and 300K
R2	1Meg	½	31P082					Treble & Switch
R3	2Meg	½	31P083					Bass

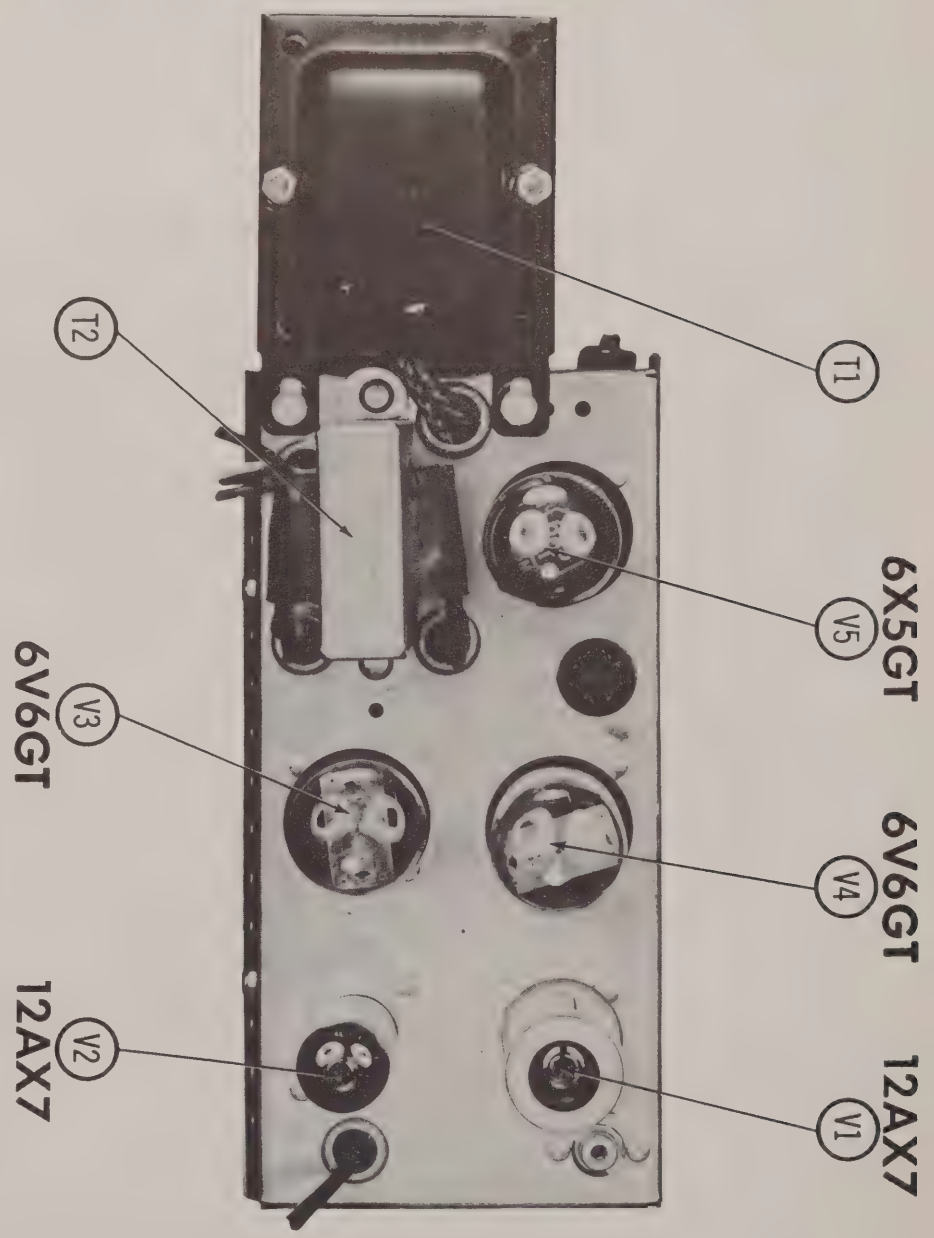
RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	WEBCOR PART No.	IRC PART No.	
R4	10K		29M1032	BTS-10K	
R5	4. 7Meg		29S4752	BTS-4. 7Meg	
R6	150K		29M1542	BTS-150K	
R7	470Ω		29M4712	BTS-470	
R8	24K 5%		29L2432	BTS-24K 5%	
R9	4. 7Meg		29S4752	BTS-4. 7Meg	
R10	68K		29M6832	BTS-68K	
R11	15Ω		29M1506	BW½-15	
R12	220K		29M2242	BTS-220K	
R13	100K		29M1042	BTS-100K	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	WEBCOR PART No.	IRC PART No.	
R14	100K		29M1042	BTS-100K	
R15	560Ω		29M5612	BTS-560	
R16	100K		29M1042	BTS-100K	
R17	150K		29M1542	BTS-150K	
R18	3300Ω		29M3322	BTS-3300	
R19	150K		29M1542	BTS-150K	
R20	270Ω	2	29M2714	BTB-270	
R21	2200Ω	1	29M2223	BTA-2200	
R22	68K		29M683	BTS-68K	
R23	15Ω		29M1506	BW½-15	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	WEBCOR PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @.27A	34VCT @.047A	6.3VCT @2.06A		68P034-4				22R38①	

① Use universal mounting brackets.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	WEBCOR PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	9.5K	6-8Ω	67P048-2①						① Has winding of 20ΩCT connected to cathode.

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	WEBCOR PART No.	QUAM PART No.	RCA TYPE No.	
SP1	6"	PM	3-4Ω	76P030①	6A1	229S1	① Used in models 1655, 1656 and 1662
SP2	6"	PM	3-4Ω	76P029①	6A1	229S1	② Used in models 1659 and 1660
SP3	4"	PM	3-4Ω	76P028①	4A1	304S2	
	3½"	PM	3-4Ω	76P043②	3A07		
	10"	PM	3-4Ω	76P042-1②	10A31	236S1	
	10"	PM	3-4Ω	76P042-2②	10A31	236S1	

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	WEBCOR PART No.	ASTATIC PART No.		ELECTRO-VOICE PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1						

PHONO NEEDLE

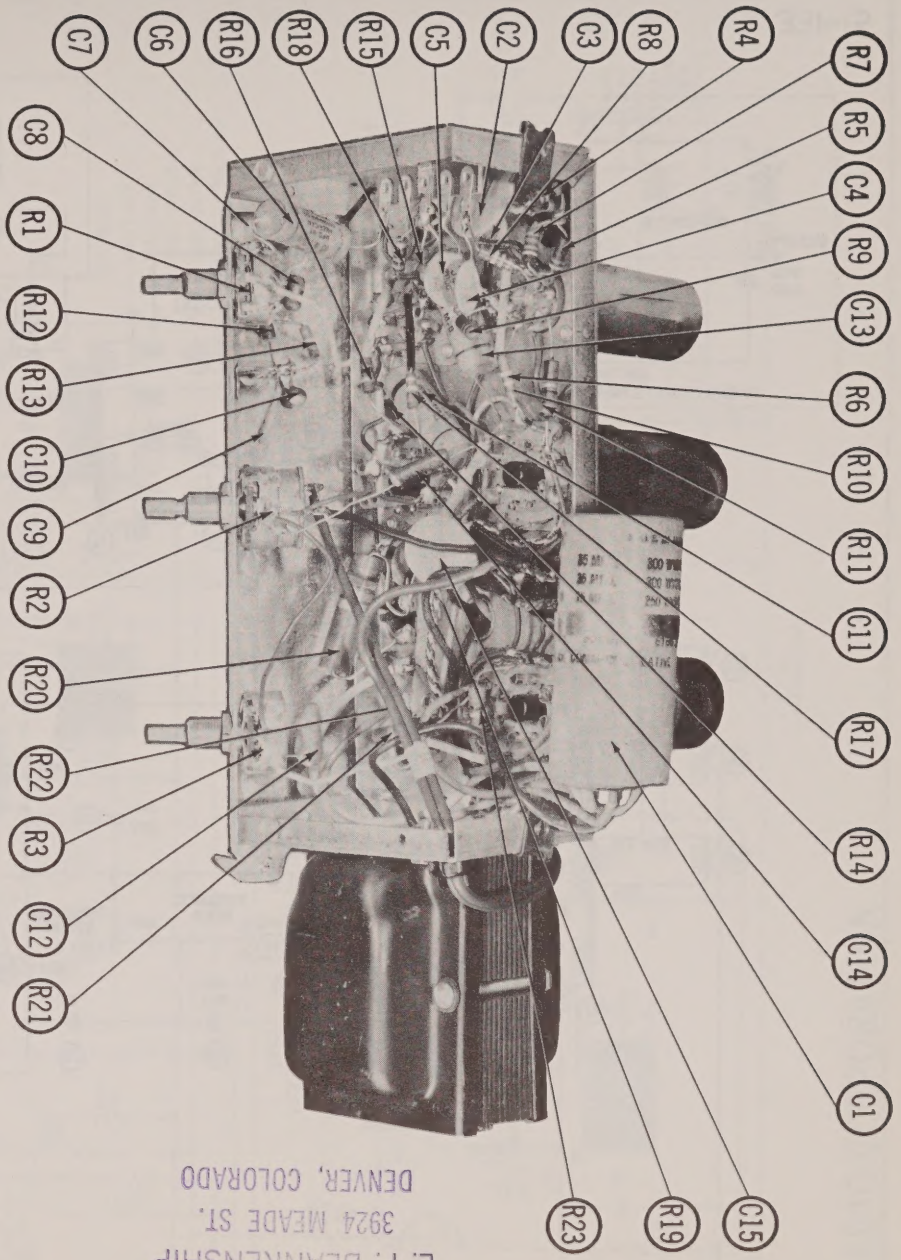
(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA				REMARKS
	WEBCOR PART No.	FIDELITONE PART No.	JENSEN PART No.	WALCO PART No.	
M2		†AC-111 or ♦†AC-111D1 or †♦AC-111D2 or ♦AC-111D	†G-13 or ♦†G-13SD or ♦G-13D	†W-66TPS or ♦†W-66DS or ♦W-66TPD	† Jewel ♦ Diamond

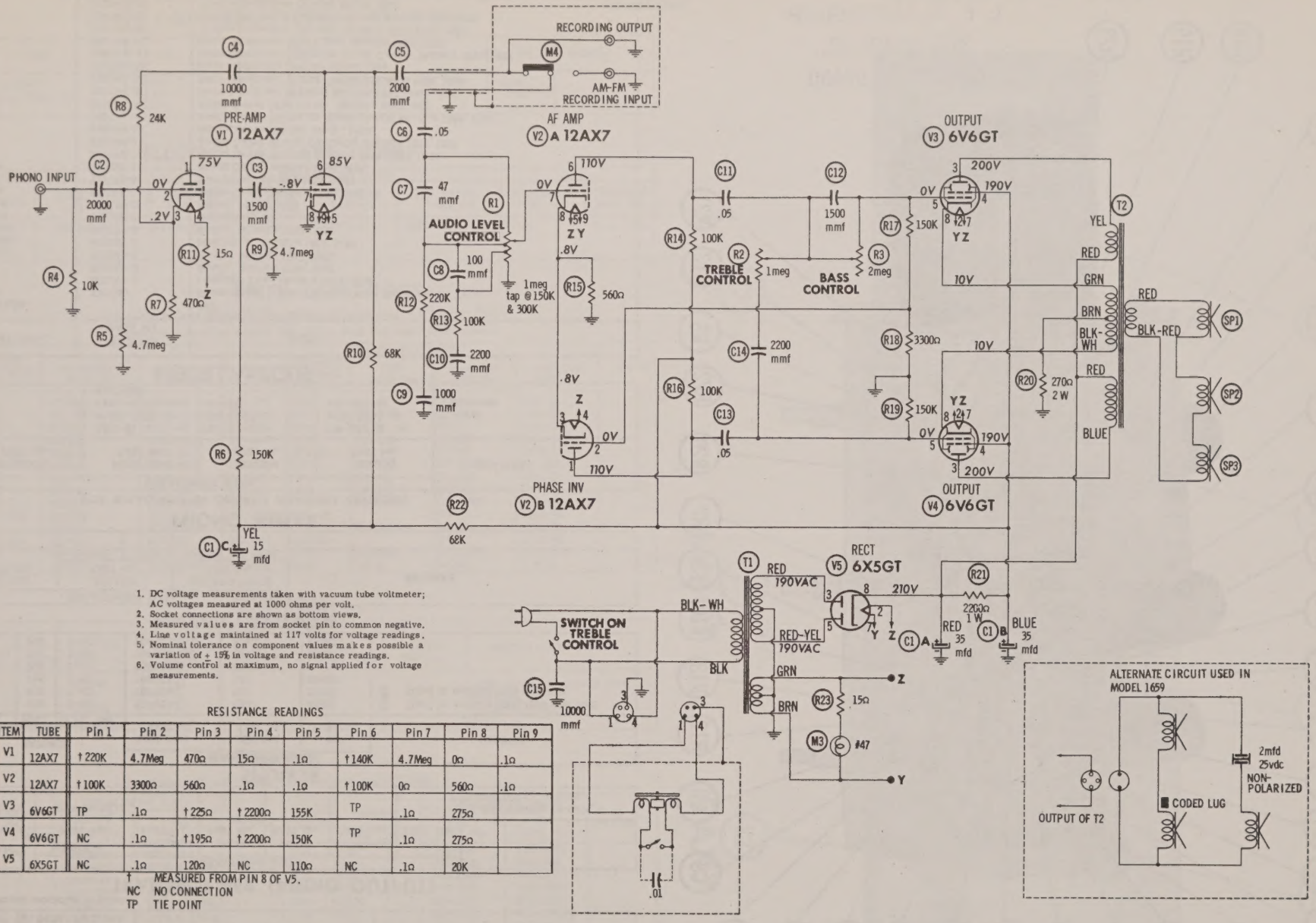
MISCELLANEOUS

ITEM No.	PART NAME	WEBCOR PART No.	NOTES
M3	Pilot Light		#47
M4	Switch	32P060	Phonograph - AM-FM Recorder (SPDT-Slide Type)
	Case	80X148-3	Luggage Tan, Models 1656, 1662.
	Case	80X148-2	Black, Models 1656, 1662
	Case	80X148-1	White, Models 1656, 1662
	Cabinet	80X137-1	Mahogany, Models 1659, 1660
	Cabinet	80X137-2	Blond, Models 1659, 1660
	Cabinet	80X130-1	Mahogany, Model 1655
	Cabinet	80X130-2	Blond, Model 1655
	Handle	39P113-1	White Case, Models 1656, 1662
	Handle	39P113-3	Tan Case, Models 1656, 1662
	Handle	39P113-2	Black Case, Models 1656, 1662.
	Knob	39P148-1C	Audio Level (Brown) Models 1655, 1659, 1660.
	Knob	39P148-1T	Audio Level (Blond Cabinets) Models 1659, 1660
	Knob	39P148-1K	Audio Level (White) Model 1655
	Knob	39P148-4T	Audio Level (White or Black cases) Models 1656, 1662
	Knob	39P148-4C	Audio Level (Tan Case) Models 1656, 1662
	Knob	39P148-2C	Bass Response (Brown) Models 1659, 1660, 1655.
	Knob	39P148-2T	Bass Response (Blond Cabinet) Models 1659, 1660
	Knob	39P148-2K	Bass Response (White) Model 1655
	Knob	39P148- 5T	Bass Response (White or Black Cases) Models 1656, 1662
	Knob	39P148-5C	Bass Response (Tan Case) Models 1656, 1662
	Knob	39P148-3C	Treble Response (Brown) Models 1659, 1660, 1655
	Knob	39P148-3T	Treble Response (Blond Cabinet) Models 1659, 1660
	Knob	39P148-3K	Treble Response (White) Model 1655
	Knob	39P148-6T	Treble Response (White or Black Cases) Models 1656, 1662
	Knob	39P148-6C	Treble Response (Tan Case) Models 1656, 1662

CHASSIS—BOTTOM VIEW



PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	†220K	4.7Meg	470Ω	15Ω	.1Ω	†140K	4.7Meg	0Ω	.1Ω
V2	12AX7	†100K	3300Ω	560Ω	.1Ω	.1Ω	†100K	0Ω	560Ω	.1Ω
V3	6V6GT	TP	.1Ω	†225Ω	†2200Ω	155K	TP	.1Ω	275Ω	
V4	6V6GT	NC	.1Ω	†195Ω	†2200Ω	150K	TP	.1Ω	275Ω	
V5	6X5GT	NC	.1Ω	120Ω	NC	110Ω	NC	.1Ω	20K	

† MEASURED FROM PIN 8 OF V5.
NC NO CONNECTION
TP TIE POINT

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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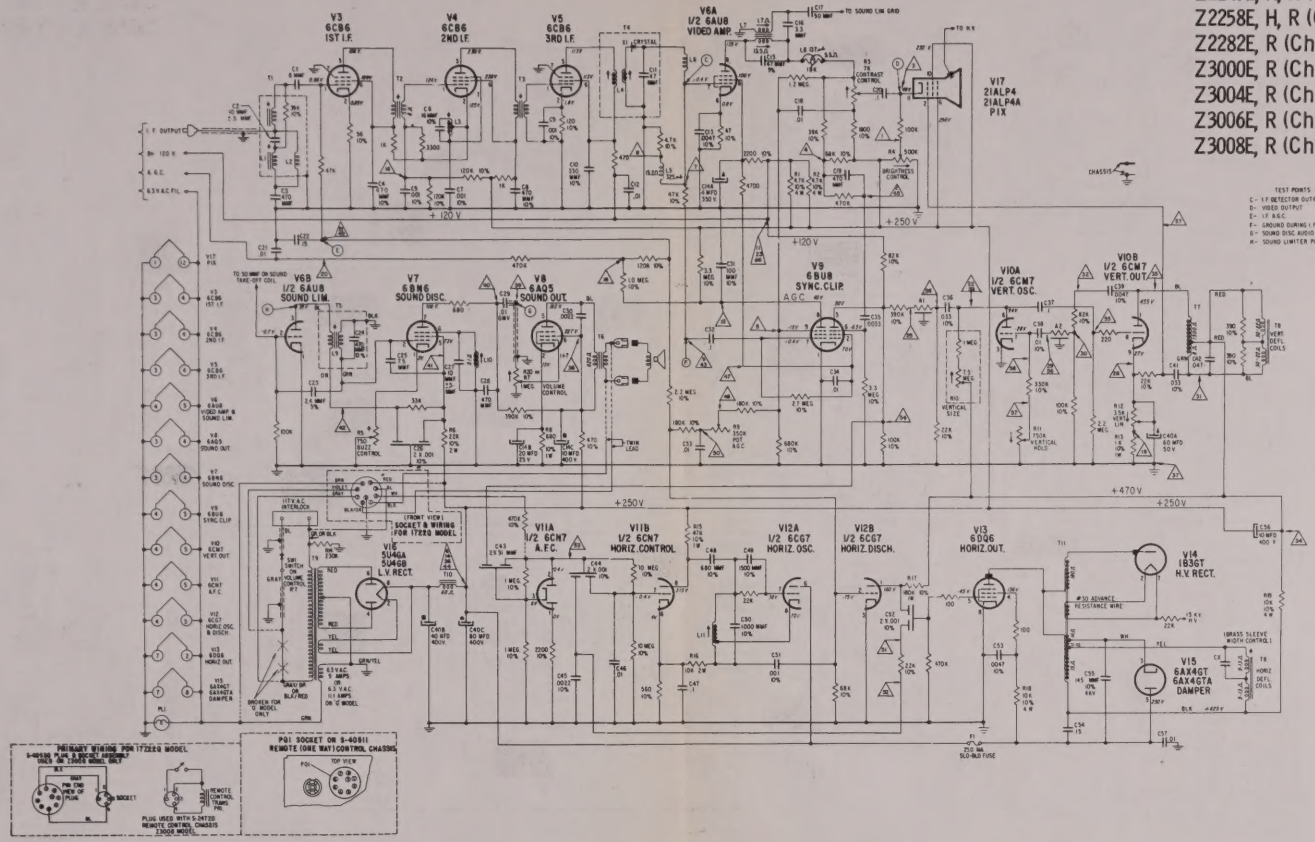
ZENITH

Z2222C, E, R, Y (Ch.17Z21)
Z2247E, H, R (Ch.17Z22)
Z2258E, H, R (Ch.17Z22)
Z2282E, R (Ch.17Z22)
Z3000E, R (Ch.17Z22Q)
Z3004E, R (Ch.17Z22Q)
Z3006E, R (Ch.17Z22Q)
Z3008E, R (Ch.17Z22Q)


V3 6CB6 1ST I.F.
V4 6CB6 2ND I.F.
V5 6CB6 3RD I.F.
V6A 1/2 6AU8 VIDEO AMP.
V17 21ALP4 21ALP4A PIX
V6B 1/2 6AU8 SOUND LIM.
V7 6BN6 SOUND DISC.
V8 6AQ5 SOUND OUT.
V9 6BU8 SYNC. CLIP.
V10A 1/2 6CM7 VERT. OSC.
V10B 1/2 6CM7 VERT. OUT.
V11A 1/2 6CN7 A.F.C.
V11B 1/2 6CN7 HORIZ. CONTROL
V12A 1/2 6CG7 HORIZ. OSC.
V12B 1/2 6CG7 HORIZ. DISCH.
V13 6DQ6 HORIZ. OUT.
V14 1B3GT H.V. RECT.
V15 6AX4GT 6AX4GTA DAMPER
V16 5U4GA 5U4GB L.V. RECT.
+120 V
+250 V
+470 V
TEST POINTS
C- I.F. DETECTOR OUTPUT
D- VIDEO OUTPUT
E- I.F. A.G.C.
F- GROUND DURING I.F. ALIGNMENT
G- SOUND DISC. AUDIO OUTPUT
H- SOUND LIMITER PLATE
PRIMARY WIRING FOR 17Z22Q MODEL
P01 SOCKET ON S-40811 REMOTE (ONE WAY) CONTROL CHASSIS

SCHEMATIC COURTESY OF ZENITH RADIO CORPORATION

ZENITH

Z2255E, R (Ch.19Z22)
Z2257E, M, R (Ch.19Z22)
Z3010E, H, R, Y (Ch.19Z22Q)

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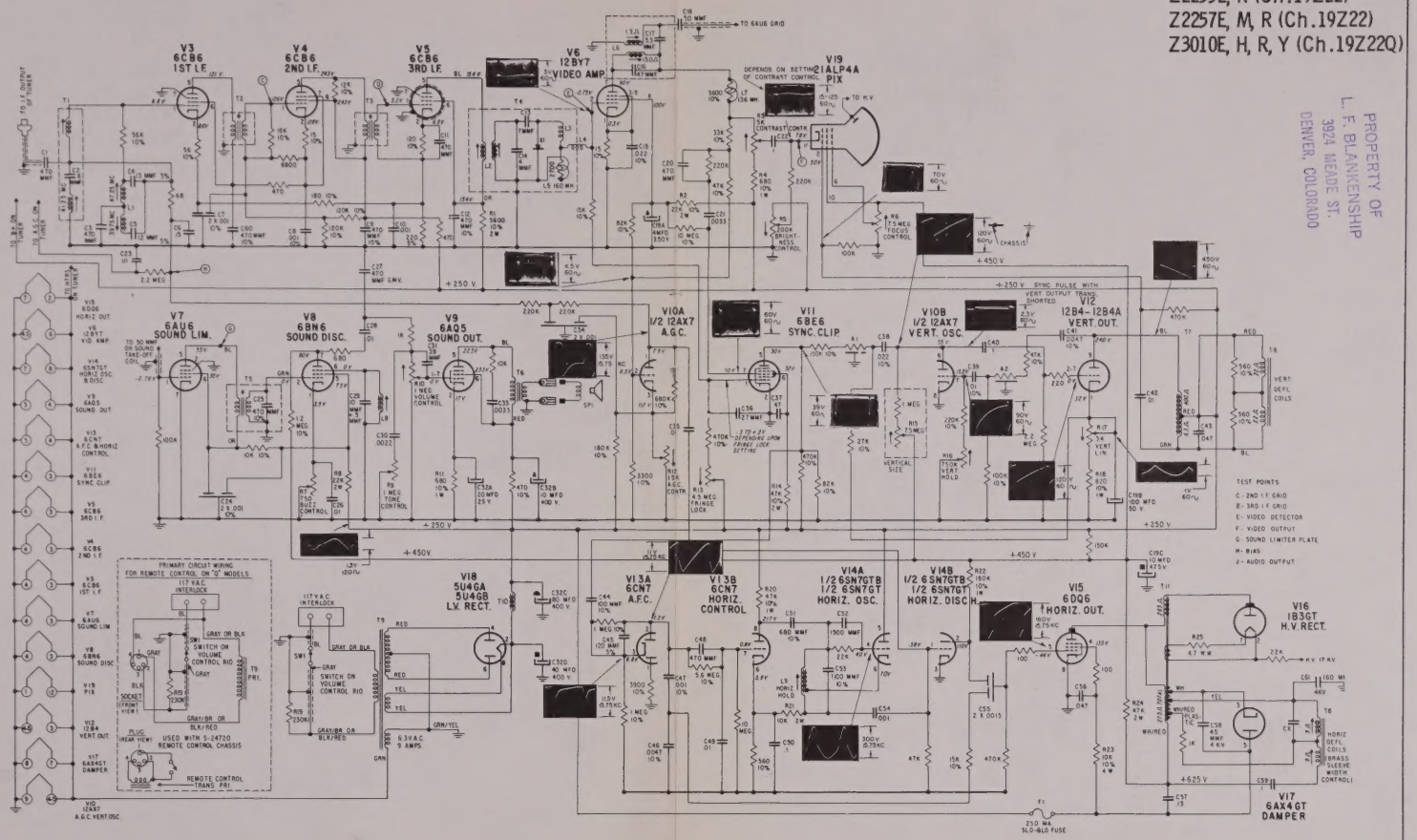

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